

# **NUTRITION SOCIETY OF INDIA**

**XXIX Annual Meeting**



## **ABSTRACTS OF SCIENTIFIC SESSIONS**

**November 21-22, 1996**

**NATIONAL INSTITUTE OF NUTRITION  
Hyderabad-500 007, India**

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# NUTRITION SOCIETY OF INDIA

## XXIX Annual Meeting



### ACTIVITIES OF NSI

## ABSTRACTS OF SCIENTIFIC SESSIONS

November 21-22, 1996

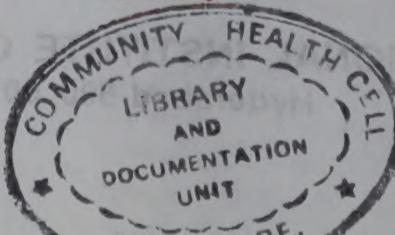
NATIONAL INSTITUTE OF NUTRITION  
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## ACTIVITIES OF NSI

### The Society

- \* Conducts meeting which include Annual Meetings, Orations, Special Lectures, Symposia, Free Communication Papers and Award of Lectures.
- \* Publishes annually the proceedings of the Nutrition Society of India which embody State-of-the Art knowledge in nutrition.
- \* Communicates with its members through a half-yearly newsletter.
- \* Honours outstanding national and international scientists in the field.
- \* Disseminates professional information through numerous Chapters spread all over India.
- \* Serves as the focal point of a network of National Continental (Asian) and International Nutritional Sciences.
- \* Encourages young and upcoming professionals in the field.
- \* Holds Panel Discussions on issues relevant to the formulations of Nutritional Policy in the country.

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# WELCOME

Dr. N. Gopalan (Chairman) - Free Foods and Cancer Risk - Science and Tradition  
John D. Peart

## EXECUTIVE COMMITTEE

Dear Colleague,

We have great pleasure in extending you a warm welcome to Hyderabad and National Institute of Nutrition (NIN). We are happy to host the Annual Meetings of Nutrition Society of India at NIN again after a period of two years.

The Nutrition Society of India, on the eve of completion of three decades of its dedicated service and existence, is organising a three-day scientific programme, which includes presentations of eminent scientists in Continuing Medical Education, Symposia and Orations. These will provide the participants an opportunity to gain and exchange information on new dimensions of nutrition. Opportunities have also been provided for active participation of a large number of members in Free Communications, Award and Poster Session.

We are confident that the scientific deliberations of XXIX Annual Meetings of the Nutrition Society of India will not only facilitate the members to update their knowledge but also act as an impetus to undertake research for improving the nutritional status of our population.

**Dr. M. Mohan Ram**  
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**Dr. T. C. Raghu Ram**  
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Particulars of the members and their awards

Community Nutrition - Senior Awards

Community Nutrition - Junior Awards

Experimental Nutrition - Senior Awards

Free Communications - Session I: Nutritional Education

Community Nutrition

Other Categories

Particulars of the members and their awards

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Free Communications - Session III: Nutritional Education

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Free Communications - Session IV: Nutritional Education

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Other Categories

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## GOPALAN ORATION

### PLANT FOODS AND CANCER RISK : SCIENCE AND TRADITION

John D Potter

Cancer Prevention Research Program

Fred Hutchinson Cancer Research Center

University of Washington, Seattle, Washington, USA

#### The Data

Consumption of particular plant foods has long been believed to be useful in the prevention and cure of disease. Until recently, the practice of Western medicine largely involved the prescription of specific plant and foods, a practice that has its origins in ancient Egypt, Greece and Rome. The modern medical practices of China and India remain even closer to their roots.

In 1981, Doll and Peto produced a wide estimate of 10 to 70% of all cancer as being attributable to diet. Much of this interpretation was based on studies showing increased risk in association with particular foods - particularly foods of animal origin. Over the past decade, however, a substantial number of studies have examined the effect of plant food consumption on health and disease. The finding that high intakes of vegetables and fruit are protective against many human cancers is better supported by the scientific literature than all other dietary hypotheses on the causes of cancer.

Over 200 epidemiologic studies have been conducted in many different parts of the world to investigate, particularly, the role of vegetables and fruit in altering the risk of cancer in different organs of the body. Stomach cancer has been the most studied - more than 30 studies, followed by cancers of the colon, esophagus, lung, and the mouth and pharynx. Statistically, significant inverse associations have been reported for one or more vegetable and/or fruit categories in more than 70% of the studies of these cancers as well as those of the endometrium (lining of the uterus), pancreas, and skin. Prostate cancer is the only cancer for which the majority of studies have not reported at least one statistically significant inverse association; and indeed, for prostate cancer, almost no study suggests a protective association.

The evidence strongly suggests that it is not consumption of one or two varieties of vegetables and fruit that confer benefit but rather an overall intake of many different kinds of plant foods is higher in those at lower risk of cancer.

#### Mechanisms

There are many biologically plausible reasons why consumption of plant foods may deter the development of cancer. There are a wide variety of chemical compounds present naturally in food that may lower risk of cancer. Some of these substances may also have a beneficial impact on heart disease, osteoporosis, and other diseases. These substances include not only some of the well-known vitamins - carotenoids, vitamin C, vitamin E, selenium, dietary fiber - but also a large number of much less discussed components of food - dithiolthiones, isothiocyanates, indoles, phenols and phytoestrogens. Many have been shown, in experimental studies, to be anticarcinogenic. Collectively, they are called phytochemicals or bioactive compounds - chemicals of plant origin that can play a crucial role in our metabolism.

The cancer process, from exposure to carcinogens or their precursors, through the changes that allow a cell with abnormal DNA to grow and multiply, to the appearance of a cancer involves many stages. The process may take years, perhaps decades. At almost everyone of the stages, known bioactive compounds can alter the likelihood of carcinogenesis, occasionally in a way that enhances risk, but usually in a favourable direction. For example, such substances as glucosinolates and indoles, isothiocyanates and thiocyanates (found particularly in cruciferous vegetables) can stimulate organs in the body to produce a multiplicity of enzymes that can inactivate carcinogens; vitamin C and phenols (present

in wine and vegetables) block the formation of carcinogens such as nitrosamines; flavonoids and carotenoids (widespread in vegetables and fruit) can act as antioxidants, essentially disabling the carcinogenic potential of a number of cancer-causing compounds; some sulphur-containing compounds - such as those found in garlic and onions - and some carotenoids, can suppress the machinery that allows the growth and division of cancer cells. Phytoestrogens (which are found in legumes, especially soybeans, and berries, or produced from dietary fiber by bacteria in the colon) may be able to reduce the risk of hormone-related cancers. Resistant starch, present in cooked rice as well as other starchy foods may be of importance in the health of the large bowel. They above compounds and those possessing antioxidant property may be equally beneficial in the prevention of chronic diseases like CHD.

### **Implications for individuals and communities**

The implications for individuals and societies around the world are clear - produce and eat more vegetables and fruit - not more pills. Vegetables and fruit contain the anticarcinogenic cocktail to which we are adapted; we abandon it at our peril.

At present, though it is not clear what quantity we should eat each day - it is clear that many people around the world do not eat enough. Therefore, setting a population target of perhaps 400 gm of food or vegetables and fruits may be a useful interim goal. Certainly, at this level, there are few dangers for any part of the population. In India, maintenance of the traditional plant-based diet, at a level of energy intake sufficient to ensure the absence of childhood malnutrition, is, along with the avoidance of tobacco use, likely to make a profound contribution in continuing the low rates of cancer that are a feature of Indian health.

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## **SRIKANTIA MEMORIAL LECTURE**

### **MICRONUTRIENT DEFICIENCY & HUMAN HEALTH AND DEVELOPMENT**

**N. Kochupillai**

Department of Endocrinology and Metabolism  
All India Institute of Medical Sciences, New Delhi

In recent times, there has been increasing awareness of the key role played by certain micronutrients in human health and development. Studies, mainly by Indian scientists from institutions like the National Institute of Nutrition and All India Institute of Medical Sciences show that deficiency of micronutrients like iron, iodine and vitamin A can seriously impair the health and development of people in developing countries. The numbers involved in this human resource damaging process are in millions. Micronutrient deficiency related ill-health has been shown to have irreversible adverse impact on effort to transform developing societies socio-economically. While socio-political efforts to promote 'empowerment' of the poor to get adequate nutrition and health care, goes on, micronutrient deficiency related impairment of human health and development can be eradicated with relatively very small financial inputs coupled with harnessing of national will through political leadership. Time is ripe to mount a major time bound national effort to reap the socio-economic and health benefits of rapid eradication of micronutrient deficiencies that afflict and main millions of poor in our country.

# SYMPOSIUM I

## RECENT TRENDS IN INFANT FEEDING

### S1.1 BREASTFEEDING AND COMPLEMENTARY NUTRITION CONTINUUM : FORMULATING MAJOR PRACTICAL GUIDELINES. HPS Sachdev, Department of Pediatrics, Maulana Azad Medical College, New Delhi

The prevalence of malnutrition amongst under five children in the developing countries continues to be high. Recent evidence indicates that growth failure, particularly stunting, occurs within a fairly narrow age range (several months after birth till about 2 years of age), coinciding with the time when foods other than breast milk are introduced. Apart from the inherent need to scientifically formulate "optimal" nutritional advise, it is believed that an improvement in infant feeding practices in this age group may represent a cost effective intervention to reduce the prevalence of malnutrition. This presentation will focus on the recent scientific advances in formulating practical guidelines with respect to some important aspects of breastfeeding and complementary feeding continuum.

#### Need for Exclusive Breastfeeding Prior to Introduction of Complementary Diet

Scientific data indicates that exclusively breastfed infants have an adequate hydration status even under fairly hot and dry environmental conditions. Extra fluids are, therefore, not required by exclusively breastfed infants to satisfy their fluid requirements. In fact, provision of extra fluids including water can be detrimental resulting in a higher morbidity and mortality, possible reduction in breast milk intake and an earlier cessation of breast-feeding with a return of maternal fertility.

#### Age of Introduction of Complementary Feeding

A comprehensive review of the available evidence indicates that in developing countries, it would be appropriate to recommend exclusive breastfeeding until "about six months" instead of "four to six months". Considerations supporting these recommendations include the following: (i) Limited merit in the earlier approach of determining the age of introduction of complementary foods from the calculated energy requirements because human milk production is fairly elastic; (ii) Invalid to base recommendations on deviations from NCHS reference population comprising top fed babies since even in affluent nations healthy breastfed infants gain less weight and length than formula-fed peers in the first year of life. Further, in the first six months of life, growth rates of fully breastfed infants in developing countries are comparable to their counterparts in developed nations; (iii) A higher risk (3 to 13 times) of diarrhoeal morbidity if complementary foods are introduced between 4 and 6 months; (iv) No growth benefit of introducing complementary feeds prior to six months in observational studies; and (v) Interventional trial confirming this lack of growth advantage and demonstrating a displacement effect of complementary foods on breast milk intake instead of an additive influence on energy consumption.

#### Complementary Foods: Frequency of Feeding and Energy Density

On the basis of recent data, theoretical estimates have attempted to define the amounts of energy required from complementary foods at different ages between 6 months and 2 years. The suggested frequency of feeding and energy density of complementary foods may be computed from these estimates. Empirical recommendations, without experimental evidence, are usually made to feed "energy dense" (sometimes oil enriched) complementary foods "more often". Observational data indicates that such uniform recommendations will not succeed in all settings; some populations may benefit from a greater frequency and others from a higher energy density. Experimental clinical studies on fully weaned (non-breastfed), recovering malnourished children suggest that both measures can enhance the total energy intake. Similar interventional data based on an observational period of 48 hours is now available from our center in healthy breastfed infants receiving complementary foods. However, these results indicate that increasing the frequency of complementary feeding from 3 to 4 times per day and adding oil to enhance the energy density *do not* result in a greater total energy intake; there was a possibility of a reduced breast milk consumption with these interventions. Simple addition of oils may have an adverse impact on the protein and micro-nutrient concentration of complementary foods. Future trials may provide firm scientific guidelines on this aspect.

**S1.2 NUTRITIONAL SUPPORT IN DIFFICULT DIARRHOEAS.** *Sankaranarayanan, Institute of Child Health, Madras.*

Abstract not received

**S1.3 HUMAN MILK BANKING.** *Armida Fernandez, Jayshree Mondkar and Wasundhara Kanbur, Department of Neonatology, LTM General Hospital and LTM Medical College, Mumbai.*

Breast milk is the perfect food for the neonate. It fulfils not only the physical need for optimum growth but also enhances intellectual and emotional development. Breast milk is also of significant importance to the low birth weight and the sick newborn as it offers protective immunological factor and other growth factors that no other milk offers. It may not be possible to guarantee a constant and adequate supply of breast milk for all sick and preterm babies unless some form of milk banking is set up.

A human milk bank can be defined as an institution established for the purpose of collecting, screening, processing, storing and distributing donated human milk that is dispensed to recipients who are not the biological offsprings of the donor mother.

In 1989, a human milk bank was established at the LTMG Hospital and LTMM College, Sion, Bombay. About 6000-7000 babies are delivered in this hospital each year of which 40-50% are high risk deliveries. Besides a 1000 to 1500 babies are transferred in from other hospitals for specialised care. All babies born or admitted to the hospital receive exclusive human milk.

#### **Organisation**

The milk bank was initially funded by a donor and is now run by the hospital. The administrative responsibilities are carried out by the staff of the Neonatal department. A technician, 2 lactation management nurses and a helper work full time in the milk bank.

#### **Donor**

Donor selection criteria have been laid down. Only supervised milk collections are carried out in the post-natal ward and out-patient departments of the hospital.

#### **Collection and storage**

Milk is manually or pump expressed into stainless steel containers and transported to the milk bank in an ice-box. Milk is pooled and stored separately as colostrum, preterm milk and mature milk and stored in the freezer at -20° C.

#### **Pasteurisation**

The milk is subjected to heat treatment in a shaker water bath - where it is heated at 56°C for 30 minutes followed by rapid cooling. This method of heat treatment is shown to kill all organisms including the HIV virus.

#### **Microbiological Surveillance**

Pre and post pasteurised samples of milk are sent for culture. Random cultures are taken from storage containers and milk pumps.

#### **Distribution**

Milk is distributed to those babies in the hospital whose mothers are unable to feed them. These include preterm and sick babies in the intensive care unit, post operative babies or those babies who have been transferred into the unit from other hospitals without their mothers. Occasionally, pediatric patients with severe malnutrition or intractable diarrhoea are also fed banked milk.

## Modifications

Modifications have been made to suit the needs of a developing country. These include donor selection criteria method of collection, type of containers and method of pasteurisation.

## Research

Studies have been carried out on methods of milk expression, different type of storage containers, effect on nutrient composition and bacteriological content of banked milk in this institution.

The role of lactoengineering of human milk and development of lyophilised human milk powder are exciting perspectives for the future.

## S1.4. NUTRITIONAL COUNSELLING, FOOD SUPPLEMENTATION AND GROWTH OF INFANTS. *Nita Bhandari, Rajiv Bahl, MK Bhan, Department of Pediatrics, All India Institute of Medical Sciences, New Delhi.*

In India, growth faltering begins after about the fourth month of postnatal life. By one year of age, in the urban slums of Delhi, about 50% children are stunted and 10% wasted. Children in this age are usually not able to benefit from ICDS programme. The growth faltering between 4 and 12 months of age is because of inadequate and unsafe complementary feeding to support breast feeding and a high mortality due to diarrhoea and pneumonia.

Traditionally, nutritional education under programme conditions has meant receiving a few messages about foods, often without taking into consideration local perceptions, food habits and with very little emphasis on helping mothers in finding solutions to problems that may be unique to them. We have developed a nutritional counselling guide based on ethnographic studies using key informant interviews and focused group discussions, and incorporating lessons learnt in recent years on how to effectively communicate with the mothers. In this method of nutritional counselling, a quick 24-hour recall is followed by identification of feeding problems using the counselling guide. Appropriate solutions are suggested to the mother, out of which the other chooses 1-2 solutions which she thinks are feasible for her.

In a randomized controlled community based trial in infants aged 4 months, we compared the impact of nutritional counselling on physical growth aimed at promoting optimal and safe complementary foods (group I), food supplementation (group II), only morbidity assessment (group III) and no intervention (group IV). 400 infants aged four months were randomized to one of the four treatment groups. Mothers of infants in group I were given nutritional counselling once a month as described above. Infants in group II were given packets of milk cereal food providing 100% of their energy requirements and were encouraged to eat as much as possible. Group I, II and III infants were examined twice weekly for morbidity assessment while those in group IV received no intervention.

Anthropometry and calorie intake by 24-hour recall method were measured at 4,6,9 and 12 months of age. Preliminary analysis of 250 children who have completed 9 months of follow up showed that the mean calorie intake at 9 months was 382 Kcal/d in group I, 732 kcal/d in group II and 174 kcal/d in group III. Infants in group II had a 380 g greater and those in group I 250 g greater weight increment as compared to group III during the study period.

Both food supplementation and nutritional counselling achieved increased increment in weight as compared to the control group but the magnitude of this benefit may fall short of what is desirable from a public health perspective. The reasons for the modest growth impact of both the supplementation and the nutritional counselling will be discussed.

## SYMPOSIUM II

### NUTRITION EDUCATION

#### S2.1 DEVELOPING HEALTH MANPOWER TRAINED IN NUTRITION. *M. Mohan Ram*, National Institute of Nutrition, Hyderabad-500 007, India

Most national governments in the developing world have launched community intervention programmes for prevention and control of malnutrition. However, studies on the nutrition awareness of personnel in the community health services delivery set up revealed severe shortcomings, indicating the need for proper orientation of these functionaries. Alongside, the need for strengthening the nutrition component in medical and paramedical professional teaching programmes was also evident.

Nutrition training courses of the National Institute of Nutrition (NIN), Hyderabad, have been beamed to strategic personnel in public health and medical teaching. These training programmes which have attained international character, provide opportunities for adequate exposure of participants to all modern theoretical and applied aspects of nutrition and afford work experience in the clinic and community situations.

Several innovative teaching methods incorporating established principles of educational technology such as community based education, task analysis approach and problem based learning techniques have been introduced in these training courses. Impact assessment studies carried out periodically have shown the practical utility of these training programmes.

#### S1.2. EMPOWERING WOMEN TO BREASTFEED : EDUCATION FOR WHOM ? *Mina Swaminathan*, MS Swaminathan Research Foundation, Madras.

The perceived trend of decline in breastfeeding in India, though still probably confined to certain groups, has generally been attributed to lack of awareness of its importance and value, as well as to the power of the advertisement of breast milk substitutes. As a result, the conventional approach to the empowerment of women to breastfeed, has rested mainly on eradicating the supposed ignorance of mothers, a task which is seen as the responsibility of health professionals. Such an approach fails to recognise the multiple roles of women as workers, homemakers and mothers, and the consequent economic, social, legal, familial and psychological constraints affecting both mother-child proximity and relationships during the early months of child's life. To overcome these constraints, the breastfeeding mother requires support from several sectors, which may be broadly identified as the Government, the employer, professionals, the family and society as a whole. To provide such support, which can help empower the mother, it is these sectors which require education, not only about the importance of breastfeeding in general terms, but more specifically, about their specific roles and the actions which each can take to address the constraints affecting the mother-child relationship. The paper will document some of the constraints, drawing on empirical data from some recent studies, and then spell out the specifics for education.

#### S1.3. EDUCATION FOR ADOLESCENT GIRLS. *Saramma Thomas Mathai*, Delhi.

Adolescence is a crucial period in a woman's life when socio-cultural factors not only influence her own health but also determine the health of the future generations. Therefore, limiting the education to the topic of nutrition alone may not be beneficial. Food intake is also determined by status of physical health and socio-cultural factors which is another important reason to broaden the scope of education to adolescent girls. Analysis of data has shown that many of the problems of maternal and child health start during the adolescent period and creating awareness among the girls will not only contribute to her own health, but also to the health of her family, particularly the younger siblings. It is not easy to reach the girls of this age group as most of them do not attend school. 'Education for better living' for adolescent girls - a project of the Nutrition Foundation of India has demonstrated how the rural girls can be reached and also the benefits of a comprehensive educational programme. The presentation will be focusing on the lessons learned from this project.

#### **4. CHILD TO CHILD PROGRAMME - A PARTICIPATORY APPROACH FOR NUTRITION EDUCATION IN SCHOOLS AND COMMUNITY.** *Parimala Subramanian and Shobha Kowli, Department of Preventive and Social Medicine, Seth GS Medical College and KEM Hospital, Bombay*

According to WHO, malnutrition though declining, still remains a major health problem in South East Asia regions. Millions of people still lead suboptimal lives because of nutritional deficiencies and imbalances, protein energy malnutrition, anaemia, vitamin A deficiency and iodine deficiency continue to affect the health of a large section of the vulnerable population of mothers and children especially amongst the urban poor in India. Within the primary health care approach, health education activities form a vital component. The Department of Preventive and Social Medicine at Seth GS Medical College has been using innovative approaches within intervention strategies designed to affect the awareness amongst the vulnerable groups, viz., mothers and children in its various community health programmes.

Nutrition related activities consist of : (1) Promotive programmes like group education of pregnant and lactating women through cooking demonstrations and exhibitions besides the health talks (2) Growth monitoring and vitamin A supplementation of preschool children (3) Nutrition supplementation to undernourished children in Day Care Centre (4) An IEC package including nutritional awareness in population education and AIDS Prevention Programme for the out of school adolescent youth in the Malavani community (5) Mid-Day Meal Programme in Municipal schools at Malvani (6) An innovative approach in school health education programme -the 'Child to Child' and 'Child to Community' programme.

The present paper focuses on the child to child programme which has been successfully implemented for the past many years at Malavani which is the field practice area of the Seth GS Medical College. Child to child is an activity based approach to raise school children's consciousness of local health problems. It has been an innovative approach to equip the child to communicate health and nutrition messages to peer group children, families and community. The activities like songs, dance, games and poster making have encouraged the participation of children in bringing about a commendable change in their own health practices and those of their families and community members. It has equipped them with skills to function as potential basic health workers. The success of child to child approach has now encouraged us to launch the youth to youth and youth to community programme in related health field of population education and AIDS awareness.

## COMMUNITY NUTRITION - SENIOR AWARDS

### CNS.1 PREVALENCE OF GOITRE AND THE STUDY OF VARIOUS ASSOCIATED FACTORS. *Rekha Battalwar<sup>1</sup> and SA Vali<sup>2</sup>, <sup>1</sup>PGTD of Home Science, Amravati University, Amravati, <sup>2</sup> PGT of Home Science, Nagpur University, Nagpur.*

The issue of endemic goitre continues to be a major public health problem in India. In spite of legislation banning the sale of uniodised salt, goitre and other iodine deficiency disorders are said to be on rise. The present work of survey on goitre is a comprehensive epidemiological investigation comprising of clinical examination, field survey and dietary survey in the identified rural tribal areas i.e., Zilpi and Logagad of Nagpur district and Darekasa and Salekasa villages of Bhandara district. A total population comprising 3,469 individuals were surveyed and out of this, 916 were goitrous individuals from which 326 were male and 590 were females. An overall prevalence rate of 26.7% was observed with a maximum prevalence in 12-18 years i.e., adolescence age group. Sexwise analysis showed that an ratio of 1:1.8 was found between affected males and females. 1b grade of goitre i.e., thyroid easily palpable and visible with the head in an extended position was present in maximum goitrous cases. The economic, literacy and nutritional status of the affected persons was very low. The signs and symptoms of hypothyroidism, hyper-thyroidism and cretinism were also found associated with goitre. A positive correlation was observed between vitamin A deficiency, PEM and complications in pregnancy with goitre prevalence.

### CNS.2 PLASMA ANTIOXIDANTS IN RELATION TO CORONARY HEART DISEASE RISK FACTORS. *Mukul Sinha<sup>1</sup> and Kanta K Sharma<sup>2</sup>, College of Home Science, <sup>1</sup> Rajendra Agricultural University, Pusa, Samastipur, Bihar, <sup>2</sup> Punjab Agricultural University, Ludhiana, Punjab.*

The relation between risk factors of coronary heart disease (CHD) and plasma concentration of antioxidant vitamins (vitamins C and E) was examined in forty CHD and twenty matching age and sex normal subjects of Ludhiana, Punjab. Dietary intake through 24-hr recall-cum-weighment method, smoking habit and other demographic information were recorded through questionnaire. Blood samples analysed by standard methods for plasma antioxidants, serum glucose and lipid profiles. Mean height, weight, BMI and antioxidant intake of CHD and normal subjects were found to be similar but a significant difference was observed between serum glucose, lipid profiles and cigarette consumption of CHD and normal subjects, the values being higher in case of CHD except serum HDL-C which was higher in normals. A positive and significant correlation was observed between plasma vitamin C and serum HDL-C levels, vitamin E with total cholesterol and LDL-C and a significant inverse correlation observed between plasma vitamin C and total cholesterol, triglycerides, LDL-C, VLDL-C and smoking habits. Serum glucose was also negatively associated to vitamin C and E indicating that by improving the plasma antioxidant status, CHD incidence may be reduced via control on associated risk factors.

## COMMUNITY NUTRITION - JUNIOR AWARDS

### **CNJ.1 UTILITY AND OPERATIONAL FEASIBILITY OF A NEW SURVEY METHODOLOGY BASED ON CHILDREN 8-10 YEARS OF AGE IN ASSESSMENT OF IODINE DEFICIENCY DISORDERS.** *Nandini Saxena, Shoba Ramachandran, Deepika Nayar, Shyam Prakash, Umesh Kapil, Department of Human Nutrition, All India Institute of Medical Sciences, New Delhi.*

The assessment of magnitude of iodine deficiency disorders (IDD) in a community by evaluation of children in 6-12 years age group, utilising the probability proportionate to size (PPS) cluster sampling approach, has been recently recommended. A study was carried out to field test and determine the operational feasibility of this methodology, evaluating school children in the age group of 8-10 years, in Delhi. A total of 30 clusters were selected using the PPS sampling procedure. In each cluster, one primary school was randomly selected for the detailed survey. A total of 6,911 school children in the age group of 8-10 years were clinically examined for the presence of goitre and casual urine samples were collected from 20% of the children to determine the urinary iodine levels. Salt samples were collected from families of 1,854 children and analysed for iodine content. Results revealed that this methodology was operationally feasible, cost-effective and rapid. In the study, a total goitre rate (TGR) of 8.6% was found. The median urinary iodine excretion of the children was 17 mcg/dl. Nearly 42% of the households were consuming salt with an iodine content of less than 15 ppm. It is recommended that in the country, this strategy should be used to assess the status of iodine deficiency and level of salt iodisation. This survey methodology could provide a scientifically valid and uniform baseline data on IDD, and when repeated after a time interval, would help in objectively assessing the impact of the interventions undertaken to combat iodine deficiency in a region.

### **CNJ.2 WEEKLY VERSUS DAILY ORAL IRON SUPPLEMENTATION IN URBAN ADOLESCENT GIRLS: EFFECT ON HEMOGLOBIN AND SERUM FERRITIN.** *Poornima Shankar and Subadra Seshadri, Department of Foods and Nutrition, Faculty of Home Science, The Maharaja Sayajirao University, Baroda.*

The major objective of the present study was to investigate if empirical support can be obtained for the hypothesis that intermittent supplementation with a high dose of oral iron, provided once a week, to coincide with the gastrointestinal mucosal renewal time, would be as effective as daily supplementation at the same dose level in human subjects. Hundred and twenty eight adolescent girls, 10-19 years, were randomly divided into three groups, placebo control, weekly and daily iron groups. Oral iron supplements, 100 mg elemental iron and 0.5 mg folic acid, in the form of tablets were given either once a week or daily depending on the group allocation. Data collected included socio-demographic information and Hb on all subjects initially and serum ferritin, dietary intake and morbidity profile on a sub-sample.

Results indicated that iron supplements brought about an increase in Hb levels when compared to the placebo control group but substantial increase in Hb occurred only in the subjects who were anaemic to start with. Weekly supplementation was as effective as daily supplementation. However, no differences were seen in the serum ferritin levels of either of the iron supplemented groups when compared with the control group.

### **CNJ.3 DIETARY SURVEY OF CANCER PATIENTS.** *Chethana KL and Jamuna Prakash, Department of Studies in Food Science and Nutrition, Manasagangotri, Mysore.*

A dietary survey was conducted to study the dietary pattern of cancer patients. A total of 146 patients were interviewed with the help of an interviewer administered questionnaire and standardized cups. Simultaneously, a control group comprising 50 individuals with no known incidence of cancer in their family were selected and interviewed in a similar pattern. The questionnaire was designed to estimate the usual intake and relative frequency of food intake. The data

collected was used for computing a day's average food and nutrient intake. Results showed that smoking and alcohol consumption were more common in men and betel and tobacco chewing in women. Cancer of genito urinary organs was most frequent followed by cancer of head and neck region. The other types of cancer observed were esophageal, breast and lungs. The incidence were highest between 41-60 years of age. The food intake pattern of subjects showed a lower intake of cereals, green leafy vegetables, roots & tubers and fruits. The intake of pulses and other vegetables was adequate and that of milk and milk products was more. The consumption of foodstuffs in control group was almost similar to patient group. The nutrient intake data did not reveal any major differences in patient and control group (male subjects). However, on comparison with recommended dietary allowances, it was found that intake of protein, energy, iron, carotene and B-complex vitamins were much below the recommendation, whereas fat, calcium and vitamin C were adequate. Similar pattern of intake was found in female subjects. Though any conclusions cannot be drawn, it can be said that intake of cereals, green leafy vegetables, roots & tubers and fruits was very low in the subjects and reflected in lower levels of protein, calories, iron,  $\beta$ -carotene and B-complex vitamins indicating a low intake of protective factors against cancer.

#### **CNJ.4 IMPACT OF SALT IODISATION ON IODINE DEFICIENCY IN SELECTED BLOCKS OF KANGRA VALLEY, HIMACHAL PRADESH.** *Shoba Ramachandran, Nandini Saxena, TD Sharma\*, Umesh Kapil, Human Nutrition Unit, All India Institute of Medical Sciences, New Delhi, \*Regional Health and Family Welfare Training Centre, District Kangra, Himachal Pradesh.*

During 1956, a survey conducted in Kangra valley, Himachal Pradesh, found the prevalence of goitre to be 41.2%. Subsequently, in 1962, the salt iodisation programme to prevent Iodine Deficiency Disorders (IDD) was initiated in the district. The present study was conducted in 1996 to assess the impact of salt iodisation on iodine deficiency in the Kangra district. The indicators recommended by the World Health Organization-United Nations Children's Fund-International Council for Control of Iodine Deficiency Disorders (WHO-UNICEF-ICCID) were utilised for the assessment of IDD. Four blocks out of eight were randomly selected. In each block, one primary school was selected using random sampling. A total of 1,358 primary school children in the age group of 8-10 years were clinically examined for goitre. Casual urine samples were collected from a sub-sample (n=245) and 372 salt samples were also collected from the families of children included in the study. The prevalence of goitre in the children 8-10 years was 5.7%. Analysis of urine samples revealed that the median urinary iodine excretion level was 16.5 mcg/dl indicating no iodine deficiency in the study population. Ninety seven per cent of the families were consuming iodised salt. The results of the present study revealed that salt iodisation had successfully controlled iodine deficiency in Kangra district.

#### **CNJ.5 CONSUMPTION PATTERN AND SAFETY OF SELECTED STREET FOODS FROM KOCHI, KERALA.** *Pramila Lodha, Usha Chandrasekhar and Kowsalya S, Avinashilingam Deemed University, Coimbatore.*

The consumption pattern of street foods from four groups of 100 respondents each comprising school children, college students, working and non-working adults was initially elicited. Based on the results, eight commonly consumed street foods were collected from three different sources like a street vendor, restaurant and a house in the city. All the samples were analysed for proximate principle composition and tested for the presence of adulterants. Four most widely and frequently consumed foods namely uthappam, idiappam, channa curry and omelette were subjected to microbial evaluation. Hazard analysis critical control point (HACCP) evaluation of one food sample was carried out and the hygienic practices adopted by 70 street vendors and 48 restaurant workers were also evaluated. The study revealed the presence of non-permitted colours, artificial sweeteners and other adulterant oils. Though the microbial counts were low, the presence of coliforms proves the low sanitary quality of food. The HACCP analysis of Bengal gram curry showed high microbial counts in raw and soaked samples but reduced during boiling and sauteeing. The hygienic practices adopted by vendors and restaurant personnel were far from satisfactory. Though foods from all sources were nutrient dense, home made foods were less expensive and quality wise superior in both restaurant and street foods.

## EXPERIMENTAL NUTRITION - JUNIOR AWARD

**ENJ.1 SHELF LIFE AND SENSORY EVALUATION OF VACUUM PACKED PANEER.** *Kavita B Mallya, Chitra L, Bahekar AT<sup>1</sup> and Subbulakshmi G, Department of Food Science and Nutrition, SNDT Women's University, Mumbai, <sup>1</sup>Mahananda Dairy, Mumbai.*

Paner, an indigenous milk product, has a very short shelf life. This study was undertaken to investigate the effect of flexible packaging materials (BOPP/PVDC, Metallized PET/PE and PET/Al foil/PE) on the shelf life and sensory characteristics of paneer stored at  $6\pm1^{\circ}\text{C}$ . Coupled with vacuum packing, metallized PET/PE was found to give a maximum shelf life of 15 days. This material is not very expensive, can be easily printed, is attractive and could be effectively used for packaging of paneer.

**ENJ.2 EFFECT OF LEAF CONCENTRATE WITH AND WITHOUT ASCORBIC ACID SUPPLEMENTATION ON THE IRON STATUS OF FEMALE POST-GRADUATE STUDENTS.** *Aditi Arya, Abha Rathi, Beena Mathur, Anuradha Goyle, Department of Home Science, University of Rajasthan, Jaipur.*

The study determined the effect of leaf concentrate (LC) with and without ascorbic acid supplementation on iron status of 30 female post-graduate students over an intervention period of 14 weeks. Of the 3 groups of 10 subjects each, one experimental group received LC supplementation, the other received LC and ascorbic acid (125 g) supplementation while the control group received no LC and ascorbic acid supplementation. Blood analysis for iron status determination was conducted at pre and post-intervention. Dietary data was collected through a 3 day - 24-hr recall method. The diets were found to be low in iron rich foods and consequently in iron but adequate in ascorbic acid. Blood analysis showed that the 2 experimental groups exhibited a better blood picture as compared to the control group. Haemoglobin levels of the experimental groups I and II had improved significantly while the control group showed no such improvement. Results further highlighted increases in haemotocrit, TRBC, MCV, MCH and Colour Index levels as well. An increase in serum iron and consequent decrease in serum TIBC levels was noted in the two experimental groups. LC supplementation had markedly improved the iron status while ascorbic acid supplementation had failed to add to this advantage.

**ENJ.3 RETENTION AND STORAGE STABILITY OF BETA-CAROTENE AND ASCORBIC ACID IN SHADE DRIED DRUMSTICK LEAVES (*MORINGA OLEIFERA*) GIVEN TWO PRETREATMENTS AND SENSORY EVALUATION AND CHEMICAL ANALYSIS OF RECIPES CONTAINING THE SAME.**  
*Monika Jain and Subadra Seshadri, Department of Foods and Nutrition, Faculty of Home Science, MS University of Baroda, Baroda.*

Two lots of drumstick leaves (*Moringa oleifera*) were procured. One lot was shade dried after steam blanching while the other one was shade dried after steam blanching followed by sulphiting in 0.2% potassium metabisulphite solution. The samples were analysed for total carotene,  $\beta$ -carotene and ascorbic acid in the fresh form immediately after drying, and on 30, 60 and 90 days of storage. Analysis of fresh leaves revealed that they contained 27.1 mg of total carotene, 17.4 mg of  $\beta$ -carotene and 143.6 mg of ascorbic acid per 100 g. Sulphiting, however, was effective in the retention of total carotene, blanched and blanched plus sulphited leaves was 47% and 53% respectively, the difference between the two being statistically not significant.

The shade dried drumstick leaves (only blanched and stored for a period of one month), when rehydrated and incorporated into recipes suffered further losses of  $\beta$ -carotene which were smaller in recipes such as dhebra and muthia that however rated as highly acceptable by a panel of semi-trained judges and two of them provided an amount of  $\beta$ -carotene equivalent to the RDA for preschool children per one serving (1.6 mg or more), even after accounting for all the losses. Thus, dehydrated drumstick leaves have the potential to serve as a valuable source of  $\beta$ -carotene in our diets.

**ENJ.4 DEVELOPMENT AND EVALUATION OF HYPOGLYCAEMIC TABLETS FROM HERBS.** *Sharmila JB, Kowsalya S and Usha Chandrasekhar, Avinashilingam Deemed University, Coimbatore.*

A study was embarked to develop and evaluate the hypoglycaemic effect of herbal tablets prepared from *Salacia prinoides* (Ekanayakam) and mixture of *Salacia prinoides* and *Strychnos potatorum* (Tettamparel). Ekanayakam was selected because of supportive literature on its hypoglycaemic property in rat and human studies. Since, it is used along with other herbs in practice, Tettamparel was selected. The dried root bark of Ekanayakam and seeds of Tettamparel were powdered, granulated and tabletted using Cadmach single stroke tabletting machine. Two types of tablets were made one with Ekanayakam alone and the other with 50:50 of Ekanayakam and Tettamparel, each tablet containing 500 mg of the respective herbal powder. A group of 42 NIDDM subjects of 40 to 55 years of age, of both sexes, falling under mild, moderate and severe categories were chosen for the study. Initially, their socio-economic status studied and food weigment survey conducted to assess their nutrient intake, followed by diet counselling to bring their calorie intake to isocaloric level. All categories of subjects were sub-grouped as experimental I, II and control and were treated with the mixed herbal tablet, Ekanayakam tablet and no herbal tablet, respectively for a period of 2 months. No control was maintained in the severe category. The dosage levels were 2.5 g, 3.5 g and 5 g per day for mild, moderate and severe diabetics respectively. Impact of the herbal treatment was studied in terms of weight changes, physiological symptoms and biochemical changes. Treatment with both the herbal tablets led to significant reduction ( $P<0.01$ ) in blood glucose, serum total cholesterol and triglycerides and increase in serum HDL cholesterol levels. In general, the Ekanayakam tablet was more effective than the mixed herbal tablet.

**ENJ.5 COOKING LOSSES OF  $\beta$ -CAROTENE FROM SELECTED GREENS OF PALAKKAD DISTRICT, KERALA AND ABSORPTION OF  $\beta$ -CAROTENE FROM PUMPKIN LEAVES IN ADULTS.** *Deepa Eapen, Kowsalya S and Usha Chandrasekhar, Avinashilingam Deemed University, Coimbatore.*

Four commonly consumed greens in Palakkad district but less familiar to other Indian population, namely, pumpkin leaves (*Cucurbita maxima*), ash gourd leaves (*Benincasa hispida*), spreading hog weed (*Boerhaavia diffusa*) and wild colocasia leaves (*Colocasia anti-quorum*) were selected based on a household survey conducted among 500 families of semiurban/rural areas of Palakkad district, Kerala. These greens were then subjected to five methods of cooking namely boiling, pressure cooking, shallowfat cooking, solar cooking and microwave cooking. Standard procedures were followed to estimate total carotene by spectrophotometry and  $\beta$ -carotene by HPLC in raw and cooked forms of greens. Other nutrients were also analysed in the raw form of greens. The greens were then cooked in a standard meal form, namely, greens poriyal and its  $\beta$ -carotene retention studied. A human absorption study was conducted wherein 15 g of pumpkin leaves poriyal was given to six normal adults as it had maximum  $\beta$ -carotene retention in its meal form. Among the four selected greens, pumpkin leaves had the highest total carotene (39,192 mcg/100 g) and  $\beta$ -carotene (34,780 mcg/100 g) in its raw form. Pumpkin leaves was also found to be a good source of calcium, iron and vitamin C, while spreading hog weed had high content of phosphorus. When subjected to varied cooking methods, maximum retention of  $\beta$ -carotene was observed in shallow fat cooking (85%) followed by pressure cooking (73%), microwave cooking (65%), boiling (60%) and solar cooking (50%). Pumpkin leaves had a mean total and  $\beta$ -carotene absorption of 58 and 72.75 per cent respectively in humans.

**ENJ.6 EFFECT OF TREATMENTS ON THE NUTRIENTS, ANTINUTRIENTS AND NUTRIENT AVAILABILITY OF MANGO KERNEL MEAL.** *Renuka P and Andallu B, Sri Sathya Sai Institute of Higher Learning, Anantapur, Andhra Pradesh.*

Mango kernel is an agro waste product with immense potential as a source of excellent fat which is comparable to cocoabutter in its physico-chemical properties. Mango kernel meal is a byproduct of mango fat industry. Though it is comparable to cereals in its nutrient composition, the presence of large amount of antinutrients has become a limiting factor for consumption. Hence the present study was undertaken to subject mango kernel meal to various treatments (boiling, HCl treatment, autoclaving, HCl followed by  $Ca(OH)_2$ ) to assess the effect of various treatments on the nutrients, antinutrients and nutrient availability (*in vitro*) of mango kernel meal and to select the best treatment wherein antinutrients are eliminated and the meal becomes suitable for consumption. Present investigation revealed that all treatments given showed a beneficial

effect which resulted in removal of most of the antinutrients, improved the availability of minerals and digestibility of proteins. However, treatment with HCl followed by  $\text{Ca(OH)}_2$  was found to be the best with respect to the elimination of antinutrients and availability of nutrients, though there is a slight decrease in the mineral content. Hence mango kernel meal treated with HCl and  $\text{Ca(OH)}_2$  may be considered as a substitute for any cereal flour.

#### **ENJ.7 THE ROLE OF DIETARY CITRATE, IRON AND CALCIUM IN ALUMINIUM ABSORPTION AND ACCUMULATION.** *Neelam, Kaladhar M and Bamji MS, National Institute of Nutrition, Hyderabad.*

Aluminium is implicated in certain neuronal and bone disorders viz., Alzheimer's diseases, dialysis encephalopathy, renal osteodystrophy etc. Aluminium and iron/calcium can have several interactions. Since iron and calcium intakes are low in Indian populations, studies were conducted with the objective to assess whether such nutritional deficiencies would increase Al absorption and accumulation in tissues.

Weanling male rats were randomly divided in groups of eight and fed on different dietary regimens formulated to delineate the role of iron, calcium and citrate on Al absorption. Body weight monitoring and estimations of haemoglobin, total iron binding capacity, transferrin saturation, serum calcium and iron, Al balance and tissue Al were done.

Body weight of rats showed no treatment (Al or citrate) related changes. Al balance studies indicated an enhanced absorption of Al on Fe and Ca restricted diets. Tissues Al levels also increased significantly by these dietary modifications. Dietary citrate seemed to exacerbate this effect. These effects were observed on moderately high levels of dietary aluminium.

The results suggest that both nutritional and dietary factors such as Fe, Ca and citrate may contribute significantly towards manifestation of chronic toxic effects of Al. Since such deficiencies are common, the health implications of excess aluminium are significant.

## FREE COMMUNICATIONS

### SESSION - I

#### 1. COMMUNITY NUTRITION

##### **CN.1 GROWTH TREND IN URBAN ADOLESCENT GIRLS.** *Shashi Jain and Maya Choudhary. Department of Foods and Nutrition, College of Home Science, Rajasthan Agricultural University Campus, Udaipur.*

A mixed longitudinal study was conducted on 2414 urban girls of 9 to 17 years of age to find out the growth trend during adolescent period. The girls were selected from two schools of Udaipur city. Weight, height, arm circumference, tricep skin folds and chest circumference were taken using standardised techniques. It was observed that all the body measurements increased with increasing age during adolescent period. Weight was ranging between 23.5 and 44.2 kg during 9 to 17 years, showing a gain of 20.6 kg at this stage. The gain was significant ( $P < 0.005$ ) with an interval of six months upto 15 years of age. The rate of weight gain is highest (8.8 kg) between 11 to 13 years of age. The mean height was ranging between 128.9 cm to 156.7 cm indicating a gain of 27.8 cm during 9 to 17 years of age. Like weight, the gain in height was significant upto 15 years of age. The height spurt occurs at the age of 10 years and reaches to its peak at 11.5 years of age with a gain of 6 cm in a year. After 12.5 years, the rate of growth in height decreased markedly upto the age of 16 years. It shows that height spurt occurs one year earlier than the weight. The girls were heavier and taller than ICMR (1972) values and lighter and shorter than NCHS (1976) values. The arm circumference was increasing from 15.9 cm at 9 years of age to 19.9 cm at 16.5 years. Rate of growth was faster after 11 years of age and reached to its peak at the age of 12.5 years. After this age, there was a sharp decrease in the growth rate of arm circumference. No systematic growth was observed in tricep skin folds with age like other body measurements. Tricep skin folds ranged between 8.1 mm at 9 years of age and 11.2 mm at the age of 15 years showing a gain of only 3.1 mm during the adolescent period. The chest circumference ranged between 58.3 cm and 76.3 cm showing a gain of 18 cm. The maximum increment of 6.23 cm was observed between 11.5 and 13.5 years. Gain in this measurement was significant ( $P < 0.05$ ) between 11 and 15 years. These results reveal that the peak age of growth among urban girls is 11 to 13 years and after 15 years rate of growth becomes slow.

##### **CN.2 INTRAFAMILY DISTRIBUTION OF GREEN LEAFY VEGETABLES.** *R Prabha and Kamal G Nath, University of Agricultural Sciences, Bangalore*

Green leafy vegetables is a perennial crop and is available in plenty and at cheaper cost than other vegetables, thus - they must be included in the diets of all the members in the family, specially adolescents, children, pregnant and lactating, whose nutrient requirements are higher. The study was conducted on 100 women each from employed and unemployed groups. Many of the respondents (24.5%) liked variety of greens because of their easy availability and for good health. Majority of the respondents (51%) were found to consume greens twice a week. Ninety per cent of the respondents consumed greens immediately after purchase. Only 10% stored greens for more than a day in refrigerator packed in polythene bags. Thirty eight per cent specially included greens during pregnancy while 42% specially included shepu during lactation with a belief that it increases milk secretion. Pressure cooking of greens was popular among 75% of the respondents. The daily per capita consumption of greens ranged between 48-66 g among the adult and adolescents as against a figure of 100 g recommended by ICMR. The monthly income and age of the respondents showed a significant impact on the per capita consumption of greens but educational level of the respondents showed significant impact (5% level) on the per capita consumption. Significant differences in the per capita consumption was observed between employed and unemployed groups. Deficit in the intake of greens was observed to the extent of 36.8%, 59.4% and 18.5% among adults, adolescents and children respectively. The requirement of  $\beta$ -carotene was satisfactorily met through greens among adults but not for adolescents and children. However, the RDA for calcium, iron and fibre was not met for any of the members in the study. Thus, it may be suggested that one of the methods of combating the deficiencies among the vulnerable section of the population is through non formal nutrition education to all the members of the family with special reference to women folk who are mainly involved in managerial aspects of households, purchase and preparation of food.

**CN.3 GERIATRIC NUTRITION AMONG FARM FAMILIES OF LUDHIANA DISTRICT OF PUNJAB.**  
SK Mann, Mandeep Aneja and K Bains, College of Home Science, Punjab Agricultural University, Ludhiana, Punjab

The study was carried out on fifty families, who had at least one elderly (> 60 years) of either sex, in two villages of Ludhiana district. The diet of the subjects was grossly deficient in pulses, roots and tubers as well as other vegetables and also in cereals in case of men. The diet of the male subjects was adequate in all nutrients except vitamin B<sub>12</sub> and zinc. Among females, the intake of niacin, vitamin B<sub>12</sub> and iron was less than the RDA (ICMR, 1990). The average weight for height of the subjects was higher as compared to an average Indian (NNMB, 1991). Forty five per cent male and 50 per cent female subjects had normal Body Mass Index. Their body fat was 29.5% and 35.1% respectively. Haemoglobin level of all males and 93 per cent females was below normal. The most commonly prevalent disorder was hypertension. Fifty per cent of the subjects had decayed, missing or filled teeth while 14 per cent had artificial denture. The nutrition knowledge score of the subjects was very low. On an average, the nutritional status of the elderly in rural areas of Punjab was satisfactory though there is scope for further improvement. Nutrition education was imparted through lectures, demonstrations and pamphlets.

**CN.4 VALIDATING DIETARY INTAKES OF RURAL PREGNANT WOMEN IN MAHARASHTRA, INDIA.**  
S Rao, A Kanade, S Rege, B Gaonkar, H Lubree and C.Yajnik\* Biochemistry & Nutrition Group, Agharkar Research Institute, Pune, \*KEM Hospital Research Centre, Pune.

Recent studies on foetal origins of adult diseases pose a challenge to understand maternal nutrition in relation to different patterns of foetal and infant growth (Godfrey K, 1992; Barker DJP, 1994). However, studies investigating maternal intakes in relation to birth weight are less consistent and coherent (Susser M, 1991) as the measures of dietary intake are weak. Present study carried out on rural pregnant mothers describes appropriate community specific modifications incorporated in conventional 24 hour recall method for estimating objectively the daily intake of rural pregnant mothers. The daily intakes were validated with weighed food records (with analysis of food samples) on 41 pregnant women. The mean daily nutrient intakes for calories, proteins, fat and iron obtained by modified method (1863 Kcal, 48.6 g, 35.3 g, 25.3 mg) were not statistically different from those obtained by weighted records. At individual levels the intakes obtained by two methods showed high correlation for calories ( $r=0.74$ ) and proteins ( $r=0.73$ ). It was also found that the sensitivity for identifying inadequacy of maternal energy and protein intake was of the order of 80% while the specificity was 82% and 63% for calories and proteins. The study thus underscores the importance of incorporating community specific modifications in 24 hour recall method for achieving the objectivity in estimating of maternal intake.

**CN.5 POOR NUTRITIONAL STATUS, EARLY MARRIAGE AND PREGNANCY OUTCOME AMONG ADOLESCENT GIRLS IN RURAL INDIA.** Gokhale MK, SB Joshi, AN Kanade and S Rao, Biochemistry & Nutrition Group, Agharkar Research Institute, Pune.

Unlike western community, the problem of adolescent pregnancy in case of developing countries is even more worst as the girls in such communities are undernourished and married off at an early age, often leading to early conception. The present study examines the impact of poor nutritional status and early conception on pregnancy outcome among adolescent girls from rural India. The 212 adolescent girls married during adolescence were followed up after marriage. Their body weight and height measurements and retrospective obstetric history were recorded. The median ages at menarche, marriage and at first conception were 14.9, 16.9 and 17.6 years respectively. Not only 72% girls in our study got married before 18 years of age but 45% of them had first delivery. The overall fertility wastage (abortions, miscarriages, still births) was of the order of 19% out of which 66% was among those who had conceived before 18 years of age. The median gynaecological age (GYAGE - the duration between menarcheal age and first conception) was 2.97 years. In case of girls (33%) as compared to those with GYAGE > 2 years, fertility wastage was significantly ( $p<0.05$ ) higher (33%) compared to those with height  $< 145$  cms also experienced higher fertility wastage (33%) compared to those with height  $>= 145$  cms (21%) indicating influence of longterm undernutrition. This risk further increased in case of short girls with lower GYAGE. Thus the synergistic relation of GYAGE with short stature and early marriage is responsible for higher fetal wastage among rural adolescent girls. Rural girls showed considerable growth in height upto 18 years of age. Further the average height before 18 years of age for the girls who had at least one child was less by 3-4 cms than those who didn't have children. This indicates that having child before 18 years of age definitely

retards the growth of young mothers. Thus the early conception in undernourished girls not only has adverse effect on mothers' nutritional status but it poses a threat for survival of fetal wastage. The study thus highlights that for reducing the fetal wastage among rural girls the health education emphasising the need for postponing first pregnancy till 18 years of age would prove more beneficial as bringing about the change in the custom of early marriage is difficult due to social/cultural traditions prevailing in the communities.

**CN.6 NUTRITIONAL STATUS, NUTRIENT INTAKE AND CHRONIC ENERGY DEFICIENCY AMONGST ELDERLY.** *Namrata Singh, Umesh Kapil and Vinod Kumar*<sup>1</sup>, Department of Gastroenterology and Human Nutrition and <sup>2</sup>Department of Medicine, All India Institute of Medical Sciences, New Delhi.

A study was undertaken to determine the adequacy of nutrient intake amongst elderly. A total of 100 elderly subjects (M:F=67:33) aged more than sixty years attending Geriatric clinic of AIIMS, constituted the study sample. A pretested interview schedule was administered to elicit information on socio-economic status of the subjects. Height and weight measurements were recorded using standard equipment and techniques. Nutrient intake was assessed by the 24-hour recall method. Results revealed that the mean height and weight of subjects was  $152\pm9.9$  and  $168\pm6.8$  cm,  $55.6\pm9.9$  and  $57.9\pm11.9$  kg for females and males respectively. BMI was calculated for each subject and it was found that 26% subjects were undernourished, while 24% were obese. The calorific ratio of various nutrients showed : protein accounted for 13%, carbohydrates 61% and fat 26% of daily energy intake. In relation to dietary recommendations, the energy deficit was 11% in males and 15% in females. The mean energy and protein intake was 31 Kcal and 27 Kcal, 1 g and 0.9 g per kg body weight for males and females respectively. The mean consumption of the basic food groups was also calculated and compared with the recommended dietary allowances. Inadequate food consumption, food fads, faulty dentures, diminished taste acuity together with presence of chronic diseases all determine nutritional status of an elderly individual.

**CN.7 DIETARY INTAKE OF NIDDM SUBJECTS.** *Seema Morani, Aarti Sankhla and Parul Mandot*, Department of Food and Nutrition, College of Home Science, Udaipur.

The findings of the study on dietary intake of randomly selected one hundred non-insulin dependent diabetic subjects (aged 40-60 years) of Udaipur city revealed that the average daily intake of cereals, pulses, other vegetables, milk and milk products and fat was found to be 195, 49, 93, 251 and 27 g respectively. Sugar intake was negligible. Inclusion of leafy vegetables, roots and tubers (11 g) and flesh foods (5 g) in their daily diet was highly inadequate. Nutrient wise contribution to total energy was less than the levels recommended for an Indian diabetic subject, however, it was high in case of fat. As per weight status, obese subjects had relatively higher intake of all nutrients. Dietary modification has been adopted as an integral part of treatment by all the subjects.

## 2. OTHER CATEGORIES

**OC.1 RENAL CALCULI (Calcium Oxalate Stone) - ROLE OF DIET.** *T Veerender Singh, GK Raghavan<sup>2</sup> and R Mahalakshmi<sup>3</sup>*. <sup>1</sup>Osmania General Hospital, Hyderabad. <sup>2</sup>BARC, Bombay. <sup>3</sup>JNTU, Hyderabad, Andhra Pradesh.

Renal calculi are usually composed of products of metabolism present in normal glomerular filtrate, often at concentration near their maximum solubility. The formation of calcium oxalate stone is favoured by increased absorption of oxalate from the intestinal flora or excess synthesis of oxalate within the body, a high concentration of the constituents of the calculi, whether due to oliguria or high rate of excretion of relevant substance, urinary pH and urinary stagnation. A follow up study was undertaken by us for three years on ten patients (3 females and 7 males), between the age group of 18-30 years, who are suffering from calcium oxalate stone in the kidney and ureter. The dietary management of the patients was as follows. Banana fruit peel and spinach were included in their regular diet, apart from reducing dietary calcium and oxalate intake. They were advised to take a glass of water at very 10 minutes interval during the day time and 3 to 4 times during the nights. Five male and two female patients could expel small stones within 6 months. Chemical analysis of these stones revealed them as calcium oxalate. There is no oxaluria or calcuria reported either before or after the expulsion of the stone on our diet therapy. There is no such reformation of calcium oxalate calculi in them till date.

All the patients were free from hazardous pain. In case of remaining three patients, latest radiological investigation could not reveal any increase in the size of the calculi. The stones which were in the kidney earlier have moved down into the ureter. There were no calcium or oxalates reported in their urine. It is concluded from the present study that in patients with a tendency of forming calcium oxalate stones, diet therapy with banana fruit peel and spinach holds good promise.

#### **OC.2 PHYSICAL ACTIVITY AMONG OVERWEIGHT ADULTS OF HISAR.** *Asha Kawatra, and AC Kapoor.* Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.

A survey was conducted on 100 overweight subjects of Hisar to know their physical activities. Most of the respondents were in age range of 40-50 years. Almost equal number of males and females participated in this study. The maximum number (45%) were having 20-30% obesity and only 14% had 30-40% obesity. Majority of the subjects (61.0%) surveyed were involved in sedentary type of work and rest 39.0% were moderately active. None of the subjects was involved in heavy work. Non-significant statistical results were observed between age and type of activity; statistically significant association among per cent obesity and physical activity confirmed that respondents with higher per cent obesity (20-30%) were mostly involved in sedentary activity. Only 34% of subjects were doing exercise. An inverse relationship was observed between frequency of exercise and physical activity.

#### **OC.3 EVALUATION OF THE CHANGES IN SERUM IRON LEVELS IN PRE-ECLAMPSIA.** *Shalini Gupta, Smiti Nanda, Uma Singh and Harbans Lal. Pt BD Sharma PGIMS, Rohtak, Haryana.*

Serum iron levels were studied in 50 patients with pre-eclampsia and the results were compared with 50 control cases. The serum iron levels in were found to be higher in eclampsia when compared to the controls and this increase was directly proportional to the increased levels of uric acid, urea and creatinine. Mean reticulocyte counts, plasma free haemoglobin and unconjugated bilirubin levels were also higher in these patients. It is suggested that haemolysis may be a major contributory factor for the increased levels of serum iron in pre-eclampsia.

#### **OC.4 DIET AUTOMATION FOR OBESE, DIABETICS AND CARDIOVASCULAR PATIENTS.** *Sujatha Sunil Udeshi and Subbhalaxmi.* Department of PG Studies in Home Science, SNDT University, Mumbai.

Today, in India, the cosmopolitan population no longer considers computers as an object of luxury or a socio-economic status, but more as an utilitarian and necessary commodity. Also, it is in this population that chronic diseases are on a rise at an alarming rate. Medical professionals are recognizing and realizing the fact that diet forms an important mode of treatment for these patients. Nutritionists and dietitians have an important role to play on wider horizons than ever before. It seems that the time is right to equip these clinical professionals with a "tool" (i.e., software) to assess and monitor patients' diets. Not much work is done in India in this direction. Keeping all these factors in mind, the objective of this study was set to develop an Indianized software for therapeutic diets based on scientific and systematic research.

The salient features of this package are : (i) Computing diets based on various personal, anthropometric, media, dietary and activity parameters. It has to be noted that while prescribing diets manually, it becomes difficult and time-consuming to consider all these aspects. (ii) A recipe bank which has a large number of recipes which encompass various cultural and staple Indian culinaries as well as traditional and modern therapeutic preparations. (iii) Appropriate diets can be generated and printed automatically for seven days at a time or selected to one's choice. (iv) Graphical presentation and assessment reports of various anthropometric and biomedical parameters with datewise comparisons. (v) The program is designed to be user-friendly with minimum amount of training required for the end-user as independent and convenient utility. (vi) The program allows a lot of flexibility for it to grow, e.g., new ingredients and recipes can be added. The program modules are developed in such a way that more query reports can be generated than the ones already existing. (vii) It will serve as an excellent tool for people carrying out diet survey. (viii) It will be an educational tool both for students and professionals in the field of nutrition and dietetics.

To explore the capability of this package, it was field-tested in various settings in hospitals, private clinics and with patients themselves. The results gave a positive feedback and also showed the awareness and preparedness of the clinical professionals to use such an Indianized software.

**OC.5 NUTRITIONAL STATUS OF ADULTS FROM ENDEMIC FLUOROSIS VILLAGES IN DHARWAD DISTRICT.** *Pushpa Bharati and Meera Rao. College of Rural Home Science, University of Agricultural Sciences, Dharwad.*

Fluorosis is an incurable endemic disease which can be prevented by consumption of drinking water low in fluoride with a diet ensuring better nutritional status. Dharwad district - an endemic fluorosis pocket was surveyed. A random sample of 308 adults from five fluorotic villages and 65 from one non-fluorotic village of Mundargi taluk were included. Height, weight and midupper arm circumference were the anthropometric measurements recorded. The adults were further categorised using Body Mass Index (BMI). Mean height of adults from fluorotic villages was 153 cm while it was 155 cm for adults from nonfluorotic village. The adults from fluorotic villages weighed significantly lower (44.3 kg) than their nonfluorotic counterparts (48.7 kg). But the arm circumference of adults from fluorotic and nonfluorotic villages did not differ significantly, though the value for adults from nonfluorotic village was numerically high. BMI classification indicated that adults belonging to chronic energy deficient grade I, II and III were more in fluorotic villages and obese grade I and II were more in nonfluorotic village.

**OC.6 GROWTH PROFILE OF SLUM CHILDREN OF PRESCHOOL AGE.** *Meenal Phadnis and Madhu Mishra. Government MLB Girls College, Bhopal, Madhya Pradesh.*

Infants and children upto the age of 5 years constitute as much as 15% of our total population and from the nutritional standpoint constitute a vulnerable group. "Growth monitoring is the need of the hour particularly so in the developing countries where there exists a host of other contributing factors that hamper the growth of a child. Growth monitoring is one way of checking and averting possibilities leading to child mortality". This study was undertaken in a slum, with a view to establish nutritional status of preschool children and to study the social phenomenon which affects the quality of life and health of this vulnerable group. The results of dietary survey show that consumption of various foodstuffs was less than RDA. Low calorie intake was seen among 78% children whereas protein intake was low in case of 42%. Anthropometric measurements of preschool children were comparable with that of ICMR's observation in Madhya Pradesh and were lower than the standards. 7% of children suffered from severe grades of malnutrition, 66.2% children examined, had shown nutrient deficiency symptoms and thus confirm the nutrient deficiency in their diets. It was found in the study that available health services were not utilised to the full extent by the slum dwellers. The reasons identified for the sorry state of child's nutritional status were mother's illiteracy, lack of sense of sanitation and hygiene, large family size and undesirable effect of urban social environment.

**OC.7 RED PALM OIL FOR COMBATING VITAMIN A DEFICIENCY.** *Santosh Jain Passi and Kumud Khanna. Institute of Home Economics, University of Delhi, New Delhi.*

In view of high prevalence of vitamin A deficiency (VAD) in our country, the Government of India is committed to overcome this problem by 2000 AD and has, therefore, taken it up as one of the National Nutrition Goals. In addition to the short-term approaches of providing prophylactic oral doses of vitamin A (1,00,000 - 2,00,000 IU once in every six months to children aged 6 months to 3 years) and fortifying foods with vitamin A, efforts are being directed towards dietary promotion of vitamin A rich foods (VARFs) - the long term sustainable solution to combat VAD. The latter involves increasing the production and availability of vitamin A rich foods i.e., the supply; coupled with effective nutrition health education of the masses for bringing about dietary diversification resulting in increased consumption of these foods and thus create their demand. Red Palm Oil - one of the highly concentrated sources, contains as high as 500-700 µg of carotenes per gram and therefore, merely 5 g of RPO can easily meet the day's vitamin A needs of any individual. Since fat is an integral component of our dietaries, substitution of commonly consumed fats/oils with RPO either wholly or partially can economically ensure adequate intake of β-carotene. However, its deep yellow colour, strong odour and high viscosity make its use uncommon. Acceptability trials conducted by our team using RPO and its blends with other edible oils have indicated fruitful results. Various food items such as laddoos, halwa, mathri, namakparas, upma and sambhar prepared by using 1:1 blend of RPO with other common fat/oils have been found highly acceptable by all age, sex and socio-economic groups. Large scale production of these food items using RPO blends can, therefore, be carried out for out-feeding at the anganwadis, balwadis, creches, schools, hostels, orphanages and such other institutions. For a greater reach, these preparations can be sold locally or at the canteens, fair price shops etc., for improving vitamin A status of our population in general and the vulnerable sections in particular.

## FREE COMMUNICATIONS

### SESSION - II

#### 1. COMMUNITY NUTRITION

**CN.8 ASSESSMENT OF NUTRITIONAL STATUS OF WORKERS AND EVALUATION OF CANTEEN SERVICES IN AN INDUSTRY.** *Sehar Anjum, CB Savitha, Jamuna Prakash, Khyrunnisa Begum and G Saraswathi, Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore.*

Importance of adequate nutrition for maintaining good health and normal physical efficiency among the Industrial workers is well established. The present study was undertaken to evaluate the dietary pattern and nutritional status of 248 employees of a private establishment involved in manufacture of electronic components. A self administered questionnaire was used to elicit background information. Nutritional status was assessed by recording heights, weights and estimation of haemoglobin levels by standard techniques. Diet and nutrient intake was assessed by 24-hour recall method. Canteen services were evaluated for service, hygiene, preparation, adequacy and meal planning. Suitable suggestions are made to improve menu planning which included use of cereals, varieties of legumes and sprouted legumes, more of green leafy vegetables, fruits and seasonally available vegetables and less of oils and fats with varieties of food preparation.

**CN.9 PERFORMANCE OF ICDS OVER TWO DECADES IN T.NARASIPURA - MYSORE DISTRICT.** *K Krishna Kumari, Anita C, Nandini N, Khyrunnisa Begum and Saraswathi G, Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore.*

T.Narasipura taluk, where ICDS was launched in 1975 as a pilot project was selected as the study area, to identify the achievements of ICDS over two decades. 125 Anganwadi centres were selected for the study. A proforma was developed to collect data on health, nutrition and education and distributed to Anganwadi workers during sectoral meetings. The filled forms were collected after 2-3 weeks. Perception of the community (n=238 men and women) about the performance of ICDS was obtained. The findings of the study revealed that the coverage of immunization was highly satisfactory (90%). IMR declined reduced from 70 to 28 over a period of two decades. Health check ups were fairly satisfactory where as the referral services were not satisfactory. The coverage of supplementary nutrition (96%) was satisfactory over a period of two decades. The grades of malnutrition in preschool children revealed that operation of ICDS has brought about an increase in the normal grade (19 vs 28%) and eliminated III and IV grades of malnutrition. However, the percentage of children in I and II grades of malnutrition remained same (30-42%). The distribution of vitamin A and folifer tablets was unsatisfactory. The non-formal preschool education was successful with 80% and 97% of enrolment and attendance respectively. However, education component on health and nutrition extended to the mothers was not satisfactory. Community perception with regard to overall performance of ICDS reveals that 60% of the community were satisfied and 4% of them were not satisfied.

*\* To be presented in Poster Session - I*

**CN.10 COST OF PROVIDING IRON AND VITAMIN A SUPPLEMENTATION TO AT RISK GROUPS THROUGH PRIMARY HEALTH CARE SYSTEM IN INDIA.** *Anand K. Pandav CS, Murthy, GVS, Gupta S, All India Institute of Medical Sciences, New Delhi*

This study is a cost descriptive study which estimates the cost of providing iron and vitamin A supplementation through the primary health care system in India. The norms for the primary health care workers were taken as per national norms. The costs included the proportionate cost of the building, workers' salary and the PHC was estimated at Rs.43,800/. The cost per beneficiary for adult folifer was Rs.3.60, for paediatric folifer was Rs.2.90 and for syrup folifer, it was Rs.15.50. The overall cost of providing iron and folic acid supplements to the "at risk" population was estimated as Rs.4.40. The cost of vitamin A supplementation to under three through the PHC system was estimated at Rs.3.20 per beneficiary per year. Both iron as well as vitamin A supplementation through the PHC system appear to be low cost interventions.

**CN.11 NUTRITIONAL HEALTH PROBLEMS OF TRIBAL PRESCHOOL CHILDREN IN DHULE DISTRICT OF MAHARASHTRA.** *SB Nagtilka, TK Motta<sup>1</sup>, VC Patil<sup>1</sup> and S.L.Kate<sup>2</sup>*, <sup>1</sup>Department of Biochemistry & Pediatrics, JMF's ACPM Medical College, Dhule, <sup>2</sup>Department of Pediatrics, BJ Medical College, Pune, Maharashtra.

Adequate nutrition is essential for the normal physical and mental development of the child. The development of the child's nutritional status never occurs in isolation; rather, a combination of various environmental factors exist which, together produce a synergistic effect. Earlier studies have shown that tribal population is particularly vulnerable to malnutrition. The present study was undertaken to find out health problems and food habits of 1-5 year children of the Pawara and Bhil communities of Dhadgaon PHC in Dhule district. A total of 200 preschool children were selected, of which 25 boys and 25 girls each belonged to 1+ to 4+ year age groups. The socio economic and dietary background of tribal families were studied using an interview schedule. Nutritional profile was assessed through anthropometric, clinical examination, haemoglobin estimation and food weight survey among 10% of total sample. Nutritional anaemia was found in 56.5% (51 M, 62 F), vitamin 'A' deficiency 25.5% (29 M, 22 F) Bitot's spot 7% (9 M, 5 F) and iodine deficiency disorders 16% (19 M, 13 F) respectively. The tribals of study area consumed both iodised and non-iodised salt. The children of illiterate poor tribal mothers had higher prevalence of diseases than those of literate tribal mothers. The boys were affected more than girls. The study suggests that there is a need for implementation of nutritional rehabilitation and supplementation with vitamin 'A' in tribal areas of Dhule district in addition to nutritional education of tribal mothers.

**CN.12 A STUDY OF DIETARY INTAKE OF ANTIOXIDANT VITAMINS OF ADULTS MEN AND WOMEN IN URBAN POPULATION OF JAIPUR CITY.** *Padmini Gupta and Rinku Dandia*, Department of Home Science, University of Rajasthan, Jaipur

The present study was conducted on the dietary intake of antioxidant vitamins of adult men and women of Jaipur City. A total of 182 respondents comprising 122 males and 60 females were selected using simple random technique. Face to face interview technique was used to collect information with the help of a closed ended structured questionnaire. Information was collected on the socio-economic and demographic profiles of the individuals. Nutritional status of the subjects was found out by taking anthropometric measurements like height, weight and computing BMI. Dietary intake of the respondents was found out by using 24-hour recall method. Majority of the respondents belonged to the younger age group. Approximately equal number of males and females belonged to the 3 income groups i.e. LIG, MIG and HIG. Majority of males and females belonged to the educational level of 11 to 15 years. More females were illiterate in comparison to males. Majority of the males (75.4%) and females (85%) were non-obese with the mean BMI value of  $23.20 \pm 3.3$  and  $21.23 \pm 3.5$  of males and females respectively. Intake of major nutrients like calories, proteins, fat and carbohydrates was found to increase with the increase in the educational level and income and decrease in the occupational classes. Among antioxidant vitamins, vitamin E was positively correlated with the increase in education ( $1.9 \pm 1.4$  mg to  $7.3 \pm 4.2$  mg), income ( $2.4 \pm 1.6$  mg to  $10.2 \pm 4.7$  mg). Intake of fruits and vegetables showed similar results. However, the intake of vitamin A and C was not significant with either educational level or occupation or any of the income groups. Males showed a higher intake of all the nutrients as compared to females with respect to education, occupation and income.

**CN.13 HEALTH AND NUTRITIONAL STATUS OF WORKING WOMEN FROM SEMI ARID ZONE, JODHPUR CITY OF RAJASTHAN.** *Ranjana Fotedar, T. Ramnath and J.Lakshminarayana*, Desert Medicine Research Centre, Jodhpur.

In India, the working women constitute about 12% of the total female population. The data pertaining to health and nutritional status of the working women from desert part of Rajasthan is limited. Therefore, a study was conducted on 200 working women from the Jodhpur city of Rajasthan mainly to assess the nutritional status of working women. Besides, breast feeding, supplementation and fertility pattern was also assessed. The analysis of the data revealed the following : The average age of the working women was  $38.7 \pm 8.73$  years. The occupation of the working women included sweepers, teachers, labourers, attendants, daily wages, grade I and grade II officers. The average income was Rs. $2345 \pm 1492$ . Their mean duration of service was  $13.1 \pm 9.56$  years. A majority (63.0%) of the women started working in order to improve their living standard. About 45% women were lactating even beyond 2 years. About 51% women did not discard the colostrum. Thirty two percent of the women introduced supplementation to their infants by the age of six

months. Late supplementation, beyond one year, was observed in 27% of the infants. Considering their BMI, 18% had poor nutritional status ( $<18.5$ ). About 27% had grade I/grade II obesity. Vitamin A, B-complex or vitamin C deficiency was not noted among the women. Thyroid enlargement was seen only in 2% of individuals. Less than 2% of the working women had hypertension. About 53% of the women were normal ( $> 11$  g) with respect to their Hb. level. Rest all had mild to moderate (6-11 g) anaemia.

**CN.14 AMYLASE RICH FOOD (ARF) : CLINICAL APPLICATION IN NUTRITIONAL REHABILITATION OF MALNOURISHED CHILDREN.** *RM Lavani, Meenakshi Mehta, Kinnari Parekh, Usha Kamdar, Kalyani Raghavan, LTMG Medical College & Hospital, Mumbai.*

A randomised clinical trial using a 'control' group and a 'test' group was carried out with an aim to evaluate the role of an energy dense porridge liquefied with amylase rich flour prepared from germinated wheat (ARF) in increasing the energy intake in severely malnourished children; to study its effect on amount of consumption, acceptability, potential for community application, and weight gain. A child was given either porridge 5 times daily, in addition to two hospital meals and/or breast feeds for 7 days. Amount consumed, calories acquired, mothers' and children's acceptability and weight gain were recorded daily. Caloric intake from 'test' porridge (ARF) (Kcal/kg/day) ( $147 \pm 72.76$ ) was significantly higher than that from 'control' porridge (SPF) ( $69 \pm 39.80$ ),  $p < 0.001$ . The amount of ARF consumed (ml/kg/day) ( $76.80 \pm 36.73$ ) was significantly higher than that of SPF ( $49.36 \pm 28.61$ ),  $p < 0.01$ . Weight gain with ARF ( $0.308 \pm 0.250$  kg) was significantly more than that with SPF ( $0.148 \pm 0.202$  kg),  $P < 0.01$ . We concluded that diet liquefied by ARF definitely has a role to play in increasing energy intake in malnourished children, it increases the amount consumed, it is well accepted and the weight gain with ARF is double than that with plain porridge.

## 2. EXPERIMENTAL NUTRITION

**EN.1 ZINC SUPPLEMENTATION AFFECTS BREAST MILK ZINC LEVELS IN WOMEN WITH LOW BREAST MILK ZINC.** *P Dhingra, S Sazawal, S Mazumder, U Dhingra, MK Bhan. Department of Pediatrics, All India Institute of Medical Sciences, New Delhi.*

Breast milk of more than 95% women in developing countries in 1st month and 100% in 3rd month cannot provide RDA of zinc. Although in western populations, zinc supplementation has been found not to affect breast milk zinc levels, possibility of impact in populations with lower zinc intakes and breast milk zinc levels is hypothesized. To evaluate if in setting where zinc intake is low, supplementing lactating women with 20 mg zinc daily for 4 weeks can improve breast milk zinc concentrations, we performed a double blind controlled trial. From an ongoing census women 0-8 weeks and 15-25 weeks postpartum were identified. Both groups received vitamin A, thiamine, riboflavin, nicotinic acid, vitamin D, vitamin E and copper in addition zinc group received 20 mg zinc gluconate. Supplement was delivered by field worker at home, who fed one dose and gave second for the evening. A 24-hour intake data collected in a sub-sample. The breast milk zinc declines sharply during 1st month. Overall paired difference between baseline and post-supplementation sample was  $-26.6 \mu\text{mol/l}$  in zinc group compared to  $-28.1 \mu\text{mol/l}$  in control group in 4-30 days post partum (PP), this difference was  $-7.61 \mu\text{mol/l}$  and percentile for baseline sample paired difference was  $-1.05 \mu\text{mol/l}$  vs  $-4.5 \mu\text{mol/l}$  in 0-8 weeks (PP) and  $-3.7 \mu\text{mol/l}$  vs  $-9.8 \mu\text{mol/l}$  in 15-25 (PP). However, in women below 33.3 windows, zinc intake in mothers was less than 6 mg/day compared to an RDA of 24 mg/day during lactation. In conclusion, although the zinc intake in this population was very low, the breast milk concentrations were similar to the western populations. The effect of supplementation on breast milk levels was restricted to women with lower breast milk at baseline, the effect being contributed mainly by women 4-30 days postpartum.

**EN.2 ROLE OF *L. ACIDOPHILUS* FERMENTED FOOD MIXTURE IN CONTROL OF DIARRHOEA.** *Binita and Khetarpaul N, Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.*

A food mixture containing rice flour, defatted soyflour, skim milk powder and fresh tomato pulp (2:1:1:1, w/w) was developed. This food mixture (100 g) was mixed with distilled water (600 ml), autoclaved, cooled, inoculated and fermented

with probiotic organism *L. acidophilus* ( $10^5$  cells/ml) at 37° C for 24 h. This fermented slurry was fed to mice which were suffering from *E. coli* induced diarrhoea. After feeding for 3 days, diarrhoea could be controlled. This fermented slurry possessed antibacterial activity towards pathogens namely, *S. dysenteriae*, *S. typhosa* and *E. coli*. Further experiments can be carried out in human beings to assess the role of this probiotic fermented food mixture to control diarrhoea as well as to provide nutrients to the suffering child.

**EN.3 PROCESSING AND NUTRITIONAL EVALUATION OF SELECTED VARIETIES OF RICEBEAN (*Vigna umbellata*).** Mushtari Begum J and Nidhi Arora. Department of Home Science, University of Agricultural Sciences, Bangalore.

Pulses still form an important ingredients of the daily diet of Indian masses. Even though, the total pulse production during 1994-95 was 13.88 million tonnes, it was not sufficient to meet the growing demand. Hence, there seems to be an urgent need to identify new pulses which are early maturing, high yielding and better in terms of nutritional quality. The present study was undertaken to determine the effects of processing on growth of rats and also to analyse the nutritional components in processed and unprocessed ricebean. Twelve ricebean varieties were procured from AICRP on under utilized and under exploited plants for the study. Significant difference between rice bean varieties was found in moisture, protein and calorie content. Considerable difference among varieties with respect to fibre fraction was not found. The calcium, sodium and potassium content was higher in rice bean varieties compared to traditional pulses. Germination and dehulling process increased protein content and reduced total phenols. The PER of germinated and dehulled sample was found to be higher compared to other processing methods. Hence, it can be concluded that ricebean is comparable with other pulses in terms of nutritional components. Unconventional pulses reduce the pressure on traditional pulses.

**EN.4 GLYCEMIC INDEX OF NEEM LEAVES INCORPORATED ITALIAN MILLET RECIPES.** Sarojini P and Andallu B. Department of Home Science, Sri Sathya Sari Institute of Higher Learning, Anantapur, Andhra Pradesh.

There are many a studies on development of recipes incorporating conventional and unconventional hypoglycaemic agents. The hypoglycaemic effect of neem leaves is of immense significance opening up new avenues for the treatment of diabetes. Hence an attempt was made in the present study to incorporate neem leaves in the recipes of Italian millet which has more protein and fibre than most of the other millets and to determine their glycemic index (GI) in normals and to see the hypoglycaemic effect in diabetics. Sensory evaluation revealed 5% incorporation of neem leaves in Italian millet roti and idli is acceptable. Both neem roti and idli showed significantly lower GI values than that of standard recipes. However, neem roti showed comparatively lower GI than that of neem idli though both the recipes had almost similar carbohydrate content. Hence neem roti was selected to feed the NIDDM subjects to see the hypoglycaemic effect. Post prandial blood glucose levels were found to be reduced considerably with neem roti than with the standard roti thus proving leaves of neem to be hypoglycaemic. Popularization of these products will not only widen the horizon of foods for the diabetics but will also help to popularize Italian millet which is not commonly consumed though rich in nutrients.

### 3. FOOD SAFETY AND CHEMISTRY

**FSC.1 DEVELOPMENT, SENSORY AND NUTRITIONAL EVALUATION OF KARONDA PICKLE.** Panwar D and Khetarpaul N. Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.

Karonda (*Carissa carandas Linn*) is a minor fruit plant of subtropical region and belongs to family *Apocynaceae*. It grows wild in Bihar, West Bengal, Uttar Pradesh, Haryana, Punjab, Rajasthan, Delhi and South India. Karonda is a berry like sour edible nutritious fruit and is a rich source of calories (364 Kcal/100 g), carbohydrates (67%), calcium (82.1 mg/100 g), iron (6.23 mg/100 g) and vitamin C (14.4 mg/100 g). There is a scope to prepare excellent quality pickle, jam etc. from this fruit. The mature unripe fruits are the ideal ones for making pickle. Karonda pickle (in oil) was prepared by washing, drying, mixing all spices i.e., mustard seed powder, roasted and powdered cumin seed, turmeric powder, asafoetida

etc. in mustard oil, mixing fruit, filling and storing in clean and airtight containers. This pickle was highly acceptable in terms of colour, appearance, taste, texture and flavour when organoleptically evaluated on a 9-point hedonic scale by a panel of 10 judges. The pH and titratable acidity (TA) of pickle were 4.62 and 1.00 g citric acid/100 g respectively. It had 2.59% total sugar 10.1% reducing and 1.57% non-reducing sugars. The contents of ascorbic acid, pectin and tannin were 13.3 (mg/100 g), 0.40 (mg/100 g) and 0.068 (mg/100 g) respectively. Storage for 6 months did not affect the sensory quality of the pickle.

**FSC.2 EFFECT OF MONOSODIUM GLUTAMATE ON HEMATOLOGICAL AND LIVER FUNCTION OF ALBINO RATS.** *Padmini Gupta and Pahlabi Tamuly, Department of Home Science, University of Rajasthan, Jaipur.*

Monosodium glutamate (MSG) popularly known as Ajminomoto salt has been used as a flavour enhancer of meat, fish, poultry and vegetables. However, it does not have any effect on the taste of dairy products or acidic or sweet foods. Its acceptable daily intake by humans through diet without any health hazard has been found to be 153 mg/kg body weight including the intake of free glutamate from other dietary sources. Glutamate at high dose may cause the so-called "Chinese Restaurant Syndrome" (CRS). Headache, dizziness, facial pressure, burning sensation on back and neck are its common manifestations. MSG is used indiscriminately in foods cooked in fast food centres and can cause health hazards. A study was carried out on 24 adult female wistar rats (6 control and 18 experimental). Rats were fed stock diet incorporated with different doses of MSG. They were sacrificed at 15 and 30 days of feeding. Blood was collected from the heart directly by cardiac puncture and the samples were analysed for total RBC-WBC count, ESR, haemoglobin, PCV, SGPT, SGOT and liver histology. At 15 and 30 days of treatment, Group III showed very significant difference as compared to control in the estimations of Hb, PCV, RBC, WBC, SGPT and SGOT. The liver cells of rats belonging to Groups I and II after 15 days treatment were found to be normal. Group III showed cellular degeneration. The liver of Group I rats after 30 days treatment was normal, whereas Group II showed focal degeneration and inflammatory cells. Group III showed degeneration of hepatocytes. In the light of the above observations, extensive use of MSG should be viewed with caution.

**FSC.3 COMPOSITION AND COOKING QUALITY OF WINGED BEAN (*Psophocarpus tetragonolobus*).** *Meera Rao and Bharati Chimmard, College of Home Science, University of Agricultural Sciences, Dharwad.*

To overcome the problem of protein calorie malnutrition, it is essential to look for under-exploited food sources within the cultural food milieu. Winged bean is a legume in which all parts of the plant are nutritious, the mature dry seed being the richest. Winged bean samples (46 cultivars) grown in the Agricultural Research Station, Siriguppa, Karnataka, were analysed for proximate composition using standard procedures. The mean values per 100 g dry basis for all samples were: Moisture 10.46 g; protein 34.27 g; fat 17.13 g; ash 4.37 g; calcium 215.06 mg; iron 11.86 mg and fibre 5.85 g. Physical characteristics and cooking quality assessment of 46 cultivars showed mean values as follows : 50 seed weight, 14.56 g; seed density 1.16; hydration capacity 49.54%; swelling capacity 66.15%; number of hard seeds 22.33%; increase in weight cooked seeds 66.96%; increase in volume of cooked seeds 110.57%; leached solids upon cooking 16.08%. The cultivars did not differ significantly in weight, size and composition. The colour differed from creamish white, brown to black.

## POSTER SESSION - I

### 1. COMMUNITY NUTRITION

#### CN.15 VITAMIN A AND CAROTENE IN MILK FROM CAMELS, goats, SHEEP AND COWS IN THE SAHEL.

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<sup>2</sup>Department of Agricultural Extension, 6th Region, Rep. of Mali; <sup>3</sup>SIK, Gothenburg, Sweden; <sup>4</sup>Division of Land & Water Resources, KTH, Stockholm, Sweden.

Vitamin A deficiency in the form of night blindness is common among women and children in northern Mali in the Sahel. Milk availability has decreased due to droughts causing loss of herds but is still likely to be the dominant source for vitamin A. The end of the dry season, May, June and July, with scarcity of fodder and low milk production are critical months for vitamin A deficiency. In addition to the scarcity of fodder, the cows are obliged to eat bleached grass (*Cenchrus biflorus* and *Panicum laetum*) from last year. Camels, goats and sheep eat green leaves from bushes and trees even during the dry season. The major species eaten by browsers in northern Sahel are *Balanites egyptiaca* and *Acacia tortilis*. Goats efficiently transform carotene to vitamin A while the vitamin A content of the cow milk reflects low in carotene in the fodder. For the purpose of comparison, milk was collected from animals in an area further south where there had been rains and fresh grass had come up. The results serve as a basis for advices what kind and amount of milk should be given to children in risk of vitamin A deficiency. There is also a need for small scale fodder cultivation of suitable species like certain *Prosopis spp.*.

#### CN.16 NUTRITIONAL ASSESSMENT OF PRESCHOOL CHILDREN WITH MINOR RESPIRATORY AND

GASTROINTESTINAL DISORDERS. *Jemima B Mohankumar* and *S Vasanthchitra*, Department of Nutrition and Dietetics PSG College of Arts and Science, Coimbatore.

A study was carried out on the general profile and nutritional adequacy of 100 preschool children suffering from minor respiratory and gastro-intestinal disorders. Data collected included family and background information, anthropometric measurements, food and nutrient intake, clinical assessment, immunization details, other minor illness and general profile of the preschool children. Family and background information revealed that child spacing was more than two years in a majority of the families. Data revealed that daily energy intake was deficient, and daily protein intake was only slightly deficient, due to the large intakes of milk. Iron and ascorbic acid intakes were greatly deficient. Heights and weights of preschool children were also below the ICMR (1989) and NCHS standards. The deficit in weight was greater in children with gastrointestinal disorders. Mid-arm circumference was also below 12.5 cm in a small percentage of both categories. A small percentage of children in both categories showed signs of angular stomatitis and dryness of the skin. Immunization details showed a maximum percentage for oral polio vaccine followed by DPT and BCG. It is, therefore, recommended that treatment of minor illness should also have a component of nutrition and health education to improve the status of preschool children.

#### CN.17 NUTRITIONAL STATUS OF PREGNANT WOMEN FROM LOW INCOME GROUP AND ITS IMPACT

ON BIRTH - WEIGHT OF INFANT. *Minal Deshpande* and *SA Vali*. Post- Graduate Teaching Department of Home Science, Nagpur University, Nagpur.

Pregnancy increases the nutritional needs of women making them and their newborns vulnerable. The effect of maternal nutrition on the outcome of pregnancy in low income group (Rs.450 to 5000 PM) was assessed. 100 pregnant women in the last trimester were selected by "Purposive Sampling" from Matru Seva Sangh, Nagpur. The assessment included Anthropometric measurements, Dietary survey and estimates of Hb level. Seventy per cent of the women were in the age group of 20-30 years. About 55% of women had normal BMI, while 43% were under weight, based on their pregnancy weights. The mean weight gain was 3.4 kg ( $\pm 2.24$ ) at the end of 7th, 8th and 9th month of pregnancy respectively. Majority of women were following a two meal pattern. The mean energy intake was deficient by 46% and protein by 64%. Intake of other nutrients were highly deficient ranging between 45 to 85% as compared to recommended

levels. Energy intake as compared with weight gain during pregnancy showed statistically significant direct relationship. Mean Hb level was 9.37 g%, 73% of deliveries were normal while rest were caesarian. The proportion of full-term babies was 86%, while the rest were premature. About 2% had congenital deformities. Mean birth weight was 2.52 kg. Statistically the results showed a significant relationship between pre-pregnancy weight, weight gain during pregnancy and birth weight of infant.

**CN.18 NUTRITIONAL STATUS OF TRIBAL CHILDREN (6-12 YEARS) FROM SUNDERGARH DISTRICT IN ORISSA.** *Pranati Nanda and SA Vali, Post-Graduate Teaching Department of Home Science, Nagpur University, Nagpur*

Dietary intake and height, weight assessment of 150 school going children from two tribal villages, Lanjibera and Khatang in Orissa was carried out. Khadia (53%), Oroan (30%), Kissan (7%) and Munda (10%) were the tribes to which the children belonged. Dietary survey indicated that parboiled rice, drumstick leaves and potato with salt and chilli were the sole constituents of the diet. 'Handia' a beverage prepared from rice was taken daily. The mean calorie and protein intake did not meet the recommended levels in 6-8 years and 8-10 years old boys and girls. The per cent adequacy of calorie was 68.9 and 69.6, that of protein was 85.3 and 72.3 in 6-8 years and 8-10 years respectively. The 10-12 years old children showed 100% adequacy for energy intake and 95.4% for protein. Intakes of Ca, Fe, vitamin A and C were found to be adequate in both the sexes of all age groups. Height and weight parameters showed marginal increase with age. Height of boys was more than girls showing a sharp increase at 8-10 years. A marked decrease in adequacy of weight parameters with increase in age as compared to ICMR values was evident (84%, 80% and 77% in boys and 83%, 78% and 67% in girls in 6-8 years, 8-10 years and 10-12 years respectively). In spite of an apparent adequacy of food intake in 10-12 years age group, the weight for age status was not satisfactory, reflecting the need for improving quality of the diet. Low literacy status, poverty and unsatisfactory living conditions seems to interfere with the designed growth pattern in these tribal children.

**CN.19 PROTECTIVE FOOD INTAKE OF HOUSEHOLD IN RURAL BANGALORE.** *Chaman Farzana, HB Shivaleela, K Geetha, TS Gowramma and MP Vaidehi, Department of Rural Home Science, University of Agricultural Sciences, Bangalore.*

Decline in per capita availability of food is expected to contribute to the impairment of quality of dietaries especially of protein, vitamin and minerals. Objective of the present study was to assess the food consumption among rural households during Kharif season. Study covered 40 households. Data on socio-economic aspects and dietary intake were obtained on a standardized schedule and measures based on which ACU and per day nutrient intake were computed. The per capita consumption of foods by the households was significantly lower than recommended allowances. Nuclear families consumed higher amount of all foods except protective foods. Joint families consumed significantly higher amounts of other vegetables (41 g/day) as compared to only 14.0 g, consumed by nuclear families. Family size had no significant impact on quantity of foods consumed. Higher the land holding higher was the per capita milk consumption. Calcium intake was higher (1432.8 mg) than recommended (400 mg) allowance. Vitamin 'A' intake was lower (479  $\mu$ g) than recommended (1200  $\mu$ g/day) intake. Nuclear families consumed higher (66.59 g) amount of protein than joint families (53.4 g). Higher the income higher was the protein intake. Study concludes that there is need for educating the rural households with regard to balanced diet for good health and to prevent deficiency diseases.

**CN.20 NUTRITIONAL PROFILE OF PRESCHOOL CHILDREN.** *D Vijayalakshmi, Nirmal Rao and KN Krishnamurthy, Smt. VHD Central Institute of Home Science, Bangalore*

The present study was aimed at finding out the nutritional status of 600 preschool children belonging to 500 agricultural families of selected taluks of Bangalore district. The socio-economic and dietary background of the families were studied using an interview schedule. The dietaries of the children were limited both in quality and quantity. Mean intake of all nutrients except protein was significantly lower than RDA. Nutritional profile was assessed through anthropometric measurements. According to Waterlow's classification higher percentage (67%) of boys were normal as compared to girls malnutrition was more among girls irrespective of the group based on height for age and weight for height. The prevalence of or type of family was not significantly related to nutritional status while size of the family and income of parents were significantly related. Hence, there is a need to call for effective nutrition programmes by government.

## **CN.21 EFFECT OF COMMERCIALISED FARMING ON HOUSEHOLD FOOD CONSUMPTION. *SH Uma***

Devi and K.Sheela, Department of Rural Home Science, University of Agricultural Sciences, Bangalore

The Investigation on the effect of commercialisation of farming on household food consumption was carried out in a village of Bangalore rural district. The sample consisted of 100 randomly selected farm families, of which 50 belonged to commercialised farm group (CFG) and 50 to subsistence farm group (SFG). The dietary status of these families was studied by collecting information on meal pattern and food consumption by weighment of raw foods. The results revealed that the income gradient observed in CFG did not influence the expenditure on food and dietary pattern. Food behaviour characteristics were similar in both group, which is partly influenced by tradition. Significantly higher per capita consumption of all the food items was noticed in CFG than SFG due to higher income from the commercialised farming. Significantly higher intake of pulses, cereals, other vegetables and milk and milk products by CFG resulted in higher nutrient intake viz., protein, calcium retinol and ascorbic acid.

## **CN.22 NUTRITIONAL PROFILE OF 6 TO 12 MONTHS ICDS BENEFICIARIES. *Archana Maheshwari and Shashi***

Jain, College of Home Science, Udaipur

The study was conducted to assess the nutritional profile of 6 to 12 months ICDS beneficiaries. A total of 120 subjects were selected with equal representation to urban and rural areas irrespective of their sex. Mother of the index child was interviewed with the help of pretested proforma to collect relevant information about the child and his/her family. The nutritional status was assessed by anthropometric measurements using standardized techniques. Body composition was assessed in terms of body fat, fat free mass and body water using Bruin *et al.*, (1995) equations. Results of the study showed that majority i.e., 76.7 per cent and 58.4 per cent of the urban and rural families were of lower middle socio-economic status. Mild form of the malnutrition was more prevalent among the study group. Weight/age and length/age was 76 and 89 per cent of the NCHS standard respectively. Although the children were registered at ICDS centres, the services were not completely utilized by them barring immunization. The proportion of malnourished children was more in rural area than in the urban. Weight, length, weight for length and BMI were higher in urban children as compared to rural children. However, the difference was not statistically significant. Total body fat and fat free mass of the study group were  $1.63 \pm 0.03$  kg and  $2.05 \pm 0.02$  kg respectively. Socio-economic status did not show statistically significant relationship with nutritional status of the children in two study areas. Weight was found to be positively correlated with length, BMI, per cent body fat and calf circumference.

## **CN.23 DIETARY PATTERN OF FARMING AND NON-FARMING PREGNANT WOMEN OF RURAL HARYANA. *Bharti Panwar and Darshan Punia, Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.***

Average daily food intake by ninety pregnant women belonging to farming and non-farming families in rural Haryana was determined using weighment method of raw and cooked items. Daily consumption of cereals (358 and 314 g), pulses (20 and 21 g), green leafy vegetables (11 and 12 g), roots and tubers (40 and 42 g), sugar and jaggery (18 and 14 g) and fruits (10 and 15 g) by farming and non-farming respondents were significantly lower than their Recommended Dietary Allowances (RDA) whereas intakes of milk and milk products (621 and 532 g) and fats and oils (29 and 27 g) were significantly higher than RDA. When farming and non-farming pregnant women were compared, the difference intake was non-significant for all food items.

## **CN.24 NUTRITIONAL STATUS IN SCHOOL GOING CHILDREN OF 6-12 YEARS IN AGRA. *Usha Mehrotra\*, Ramesh Prasad\*\*, P.P.Mathur\*\*, Meena Singh\*\*, Department of Food and Nutrition, Institute of Home Science, Agra; \*Department of Paediatrics, SN Medical College, Agra***

The school children with their poor existing nutrition conditions are in need of health promotion health appraisal and health restoration. To monitor the health of school children, assessment of nutritional status is one of the most important parameters. A total sample of six hundred school going children aged 6-12 years were selected for the present study from three areas i.e. slum, rural and urban of Agra. Two hundred children were selected from each area. The children were classified according to age and sex. The nutritional status of the studied population was assessed by indicator given by

WHO (1983). The methodology used for statistical analysis were arithmetic mean, SD, chi-square and 't' test. The result revealed that the nutritional status was poor in slum (80.5%) and rural (69.5%) children than urban children (25%). The majority of children had long duration and past history of malnutrition. The nutritional status of 7-9 years age group was worst (83.8%) in comparison to other age groups. The difference in nutritional status was significant according to areas ( $X^2 = 171.07$  df = 6, p < 0.001) and age group ( $X^2 = 15.17$  df = 6, p < 0.05). The female children had poor nutritional status than male, but the difference was not significant.

#### **CN.25 FOOD CONSUMPTION PATTERN IN SCHOOL GOING CHILDREN OF 6-12 YEARS IN AGRA. *Usha***

*Mehrotra*\*, Ramesh Prasad\*\*, Meena Singh\*\*, "Department of Food and Nutrition, Institute of Home Science, Agra; \*Department of Paediatrics, SN Medical College, Agra

The school age is a dynamic period of growth and development. Malnutrition is the common problem during school age period. It is evident that an adequate diet and nutrient intake during childhood is very important for proper growth and development. In the present study, two hundred children each of school going age from 6-12 years were selected from slum, rural and urban areas. The children were classified according to age and sex. The 24 hour recall method was used for dietary data collection. It was found that majority of children were vegetarians and the diets were predominantly cereal based. The consumption of cereals, roots and tubers was significantly higher in slums and rural areas than in urban areas. The consumption of protective food as well as energy rich foods i.e., pulses, leafy vegetables, other vegetables, fruits, milk and milk products, fats and oils and sugar and jaggery was significantly higher in urban children than slum and rural children. The food consumption pattern was much better in slum children than rural. The sex differences were observed in food consumption pattern but were not significant.

#### **CN.26 NUTRITIONAL STATUS OF URBAN LACTATING WOMEN. *Deepali Trivedi* and *Maya Choudhary*, Rajasthan Agricultural University, College of Home Science, Udaipur**

The pattern of growth and physical state of body is influenced by diet and nutrition. In the present study, the effect of diet (including traditional supplementary foods) during lactation on the nutritional status of thirty lactating women from each of the different periods of lactation i.e., 0-14 days (group-I), 15-21 days (group-II), 22-28 days (group-III) and 29-42 days (group-IV) were studied. The results revealed that weight gain during pregnancy ranged from 9-11 kg. The mean body weight of these women, during lactation, ranged from 49 (group-I) to 54 kg (group-II) and BMI ranged from 20.4 to 22.5, showing a normal nutritional status. The body fat calculated from skin fold measurements ranged from 12.8-15.2 kg at the time of survey. The diet survey revealed that the intake of milk was as per the balanced diet while the intake of fat and sugar coming from traditional supplementary foods was very high i.e., 220% and 323% of balanced diet respectively. The intake of other foods such as cereals, pulses, vegetables ranged from 72-109% and fat ranged from 317-486%. The intake of protein is only 51% of RDA and carbohydrate providing only 38-41% of total energy intake revealing that a poor intake of these nutrients. The traditional supplementary foods (TSF) contributed 33% of calories and only 10% of protein in their daily diet. The above results suggest that although the women were consuming a significant amount of fat through TSF, still the gain in body weight was only 0.5 to 2 kg in comparison to the pre-pregnancy weight. This might be due to its utilization for the demand of lactation rather than to increase the body weight.

#### **CN.26 PHYSICAL WORK PERFORMANCE IN RELATION TO ENERGY BALANCE AMONG FARM WOMEN. *S Chadha*, M.Nagi, S.K. Mann and P.Bakhetia, Department of Foods & Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana.**

One hundred adult women belonging to low economic group were selected from villages *Phoolaanwal* and *Daad* of Ludhiana district to assess the physical work performance in relation to energy balance. The intake of all the foods was adequate except cereals, fats and oils and green leafy vegetables. The mean daily intake of energy, protein and iron was  $1872 \pm 30.4$  Kcal,  $61 \pm 1.2$  g and  $19.8 \pm 0.44$  mg, respectively. The intake of all other nutrients was inadequate except for protein, calcium, phosphorus, niacin and riboflavin. The average body weight and height of the subjects was  $49.86 \pm 0.93$  kg and  $157 \pm 0.46$  cm, respectively while the average BMI was  $20.2 \pm 0.35$  kg/m<sup>2</sup>. The overall haemoglobin level (Hb) of the subjects was  $8.7 \pm 0.15$  g/dl. The mean energy expenditure of the subjects was  $1979 \pm 33.9$  Kcal/day which resulted in a negative energy balance of  $107 \pm 7.90$  Kcal/day. The average rapid fitness index score of physical fitness was  $26.03 \pm 0.43$  depicting poor physical fitness due to their unsatisfactory iron and energy status.

**CN.27 COMPARATIVE STUDY OF PRE-AND POST MENOPAUSAL WOMEN ON BODY COMPOSITION, ENERGY STATUS AND ENERGY COST OF PHYSICAL ACTIVITY.** Neetu Nagpal, Anupa Siddhu and Monika Gambhir, Lady Irwin College, New Delhi

Menopause is a natural phenomenon in the life of woman which brings about enormous changes in her hormonal milieu which have implications on body composition and hence energy metabolism. The study was conducted to obtain a perspective of changes in the physical characteristics, energy balance (EB) and energy cost of physical activities (ECA) during the transition from pre-to post-menopausal years. For the purpose, thirty women each in premenopause (n=30) and postmenopause stage (n=30); (aged  $44.2 \pm 2.6$  years and  $55.4 \pm 2.8$  years respectively) were studied. Energy intake (EI) by dietary record method and Energy expenditure (EE) by factorial method (using FAO/WHO/UNU, 1985 values) were calculated and BMR was estimated using weight dependent prediction equations given by the Indian Council of Medical Research (ICMR, 1990). Physical activity level (PAL) and energy spent on physical activity and thermogenesis (calculated as TDEE - (BMR) were also compared between the two groups. Energy cost of eight standardised activities were measured on a subsample using 'Oxylog II'. Physical indicators of body composition like weight, waist to hip ratio and body fat percent ( $p < 0.01$ ) and BMI ( $p < 0.05$ ) showed significant increase in postmenopausal women. The EE of postmenopausal women declined significantly ( $2041 \pm 241$  Kcal;  $p < 0.05$ ), when compared to premenopausal women ( $2117 \pm 86$  Kcal) using same ECA and weight dependent BMR equation. EI also decreased significantly ( $p < 0.05$ ) in post menopausal women ( $2086 \pm 96$  Kcal) as compared to premenopausal women were significantly higher (5-14%) for the same household activities than in premenopausal women, while ECA in premenopausal women were comparable to FAO/WHO/UNU (1985) energy costs. To conclude, our findings strengthen the fact that postmenopausal women undergo changes in body composition, EE, EI and energy status. Moreover, higher energy costs in postmenopausal women support that menopause is a major event in altering energy metabolism.

**CN.28 ATTITUDES OF MEDICOS ABOUT NUTRITIONAL COUNSELLING AND ITS STATUS IN MEDICAL EDUCATION.** Parul Mandot and Aarti Sankhla, Department of Food and Nutrition, College of Home Science, Udaipur

The study of the attitudes of all the 104 final year students of R.N.T. Medical College, regarding nutrition revealed that they considered nutrition as an integral part in health care. Majority of them do realize the importance of diet and its counselling in medical treatment. Almost all of them were in agreement that nutritional counselling is necessary for better health care of the community. A high proportion (97%) of medical students considered themselves as one of the responsible person for Nutrition Counselling. All but four medical students agreed that physicians should have adequate knowledge about therapeutic nutrition. Moreover, they felt that they should participate in nutrition related seminars, meetings and symposium to keep abreast of current information. Most of them (63 - 92%) were not satisfied with the existing counselling practices and realized the need of establishing at least one nutritional counselling centre in every city and according to them, nutritionist should take initiative in this regard. Forty six per cent were not satisfied with the duration and 60% with the contents of their medical-nutrition education. More than 80% subjects were in favour of offering elective courses of nutrition and seeking help of nutrition expert for effective teaching of the component.

**CN.29 DAIRY DEVELOPMENT AND SOMATIC STATUS OF PRESCHOOLERS.** Mushtari Begum J, Department of Home Science, University of Agricultural Sciences, Bangalore

The study was conducted to determine whether income generating activity such as cooperative dairying was associated with an improvement in growth status particularly of preschool child, who from nutritional stand point is a vulnerable individual. Study was conducted at Devanahalli taluk, Bangalore district, Karnataka. Members of cooperatives with a child in preschool age were randomly selected for the study. They were further grouped as small marginal and large producers. In addition, non-producer families were also included to serve as control. ANOVA of anthropometric data showed that while the differences between the study groups were not significant those between age groups were highly significant. There were no marked differences between boys and girls with respect to nutritional status. However, as age increased the number of children who were normal as per Gomez's classification decreased. Using weight for height as the index when children were classified into four groups, more children from large producers families were found to be normal. Hence, it can be concluded that children from large producers families were better with respect to somatic status.

### **CN.30 NUTRITION PROFILE OF ICDS BENEFICIARIES IN T.NARASIPURA TALUK - MYSORE DISTRICT.**

*C Anita, Krishna Kumari K, Nandini N, Khyrunnisa Begum and Saraswathi G, Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore.*

Nutrition situation of the beneficiaries of ICDS in T.Narasipura taluk which is functioning since 20 years, was assessed. Forty one, out of 125 anganwadi centres and 10 out of 22 non-ICDS villages were selected as experimental and control groups. All the beneficiaries of ICDS area were considered for the study and in non-ICDS area the subjects were selected by home visits. The findings of the study revealed that the coverage (91-96%) of supplementary nutrition was satisfactory. The percentage of preschool children in normal grade was lower (7 vs 17%) in ICDS than non-ICDS area as per Gomez classification. However, the percentages of children in the I and III grade were essentially similar in both the groups, while II grade was lower in the later. High percentage (50-79%) of pregnant and lactating women belonged Chronic Energy Deficiency in both ICDS and non-ICDS areas. Clinical evaluation indicated that the prevalence of PEM, Vitamin A, B-complex and iron deficiencies were more in non-ICDS than ICDS areas. High percentage (60-99%) of the subjects suffered from anaemia in both the groups. However, 4-6% exhibited severe grade in ICDS area. The distribution of vitamin A and folifer tablets was not satisfactory. Mothers from ICDS areas were fairly knowledgeable in health and nutrition, however, the coverage of HNE component was not satisfactory. In general, it may be stated that despite satisfactory coverage of supplementary nutrition, a moderate success in reducing malnutrition was observed.

### **CN.31 DIETARY ASSESSMENT OF INDUSTRIAL WORKERS IN PUNE.** *Medha Patwardhan, Dietitian, M.M.F. Joshi Hospital, Pune.*

Importance of adequate nourishment in improving work efficiency, among industrial workers was recognized way back during second world war. Providing subsidized meals for the workers is one of the ways of improving their nourishment. However, general observations indicate that in spite of food subsidy, workers do not exhibit expected health, nutritional status as well as work efficiency in industries. Hence, it was of interest to find out underlying causes and recommend the ways to achieve expected health and nutritional standards of industrial workers. Preliminary survey was conducted using questionnaire method to collect the information about usual diet at home, activity pattern and amount and type of food they get at work place. It was observed that only 17% of total 179 workers under study were having balanced diet. One third (31%) of the workers consumed inadequate protein. However, energy deficit was not observed to a considerable extent, consumption of fruits and vegetables were grossly inadequate resulting in deficient intake of vitamins and minerals. It was observed that awareness regarding proper food selection for optimum nourishment is lacking. Hence, nutrition education to workers, their family members, personnel in food service management seems to be the most effective measure for improving health and nutrition and industrial workers. Awareness programmes were conducted for workers during the project and hand-outs were distributed to the workers in order to motivate them for nutrition education.

### **CN.32 NUTRITION KNOWLEDGE OF RURAL PRIMARY SCHOOL CHILDREN.** *PVVS Murthy and Mahtab S Bamji, Dangoria Charitable Trust, Hyderabad.*

Prior to initiating Programme of Health and Nutrition Education amongst rural school children, knowledge of 120 children studying in 5th class was assessed through a questionnaire. Eighty children were from 10 villages, where the National Institute of Nutrition had earlier conducted a programme of promoting home gardening for combating vitamin A deficiency (Group A). The remaining children were from schools in village Narasapur (taluk headquarters) and a nearby village, who did not have earlier exposure to nutritional programmes other than ICDS (Group B). Most children mentioned energy as the function of food. Knowledge regarding nutrients was poor. Prominent mention of green leafy vegetables, followed by papaya and carrots as sources of vitamin A, was made by the children of group A school but not the group B schools. Knowledge regarding anaemia, night blindness, vulnerable groups, and cooking methods was also much better in group A suggesting that children learn even from IEC programmes which are not directly targeted at them. The practices of discarding excess rice water (ganji) was reported by 77% children in group A villages and 93% in group B villages. Most children knew about immunization for health, but could not mention the diseases. Knowledge regarding causes of diseases like diarrhoea, malaria, tuberculosis etc., was very poor. Most children could name safe sources of drinking water.

**CN.33 NUTRITION KNOWLEDGE ATTITUDE AND PRACTICES OF MOTHERS RESIDING IN ICDS-SERVICED VILLAGES.** *KV Lakshmi, PVVS Murthy and Mahtab S Bamji, Dangoria Charitable Trust, Hyderabad.*

Late introduction of complementary food is one of the major causes of childhood malnutrition. Prior to initiating an awareness - generation programme amongst mothers, a KAP study was carried out among 130 mothers having children aged 6-12 months. Sixty five mothers were from the village Narasapur (Group I), Medak district, AP, which is the taluk headquarter, and remaining 65 were from the surrounding smaller villages (Group II). Literacy was only 28% in group I and 9% in group II were housewives. While no women mentioned need for more food during pregnancy, 27% mentioned need for less food. More than 80% avoided some food or the other, the main ones being papaya, followed by banana and GLV. While there was no evidence of erosion of breast feeding, more than 50% did not give breast milk on the day of delivery. Most mothers gave after 3 days. After 6 months, only 4% in Narasapur and 25% in villages gave the ICDS mix. On the contrary, 34% in Narasapur and 15% in villages gave commercial foods. The reasons for not giving ICDS food were, "not required", rejection, diarrhoea and doctors' advise. Most mothers discarded excess water from rice (ganji), out of fear of pesticides, body pains and swelling, or even doctors' advise. The survey indicated scope for nutrition education both mothers and for the local doctors.

**CN.34 PREVALENCE OF NUTRITIONAL PROBLEMS IN PRESCHOOL CHILDREN, FROM LOW SOCIO-ECONOMIC GROUP IN AKOLA CITY.** *Manisha Kale, Asha Mane and Madhuri Punse, Post-Graduate Teaching Department of Home Science, Amravati University, Amravati.*

This study was carried out among 100 children of age 3-6 years belonging to low socio-economic group of age 3-6 years, from slum area of Akola city, to assess their nutritional status. Data was collected by questionnaire and interview method. The overall prevalence of clinical forms of nutritional deficiency was 62%. About 15% children had one sign, 17% had two signs and 30% had equal to or  $> 3$  signs of nutritional deficiency. It was observed that socio-economic status, weaning practices, treatment during illness, environmental conditions, personal hygiene, cooking practices adopted by parents have significant association with nutritional problems. There was no association between age, sex, size of family and type of nutritional problems. Thus, it is concluded that it is an interplay of many factors responsible for high incidence of nutritional problems. So adequate attention should be given to eliminate these problems by establishment of primary health care centres, health and nutritional education, improvement of personal hygiene, improved nutritional and clean water supply.

**CN.35 NUTRITIONAL STATUS OF DEAF AND DUMB CHILDREN OF AMARAVATI CITY (6-12 YEARS).** *Sandhya Joshi and Alaka Gulhane, PGTD of Home Science, Amaravati University, Amaravati.*

It is reported that about 42 million individuals world wide above the age of three years suffer from hearing impairment and dumbness. Several studies have been undertaken on teaching, learning skills and other various problems of deaf and dumb children. However, the problems relating to food, nutrition and health have been given the least importance. Therefore, a study was carried out on 100 hostellers and 100 day scholars belonging to the age group of 6-12 years to assess their food intake and nutritional status.

**CN.36 ENERGY EXPENDITURE PATTERN, NUTRITIONAL STATUS AND SOCIO-ECONOMIC STATUS OF HILL WOMEN.** *Tara Joshi and Rs S Raghuvanshi, Department of Foods and Nutrition, GB Pant University of Agriculture & Technology, Pantnagar.*

Women of hill region are mainly engaged in agricultural activities. Due to characteristic topography of this region and lack of agricultural facilities they have to work hard leading to high energy requirements. The study was conducted to determine the socio-economic status. Nutritional status, energy intake and expenditure of hill women and to see the impact of maternal health on the nutritional status of preschool children in three villages of Lamagarha block of Almora district. Working behaviour of women was noted by observing their activities throughout the day. Energy expenditure was calculated by using the time spent on various activities and table values of energy costs of these activities according to the socio-economic group. The female agricultural workers showed on an average energy expenditure of  $2702 \pm 410$  Kcal per day spent on various activities classified as agricultural, household, livestock tending, child care and other activities. In the peak agricultural period all the women were engaged in harvesting of crops and spent a maximum per cent of their total

time and energy on agricultural activities. The lower socio-economic group spent relatively more energy and time on household activities and livestock tending activities as compared to the upper socio-economic group. The upper socio-economic group spent more time and energy on agricultural and child care activities as compared to the lower socio-economic group. Average energy intake of adult females was 1567 Kcal/day. The average weight and height of the women was  $37.4 \pm 4.10$  kg. and  $147.3 \pm 4.92$  cm. respectively. There was positive correlation between the nutritional status of mother and child. It may be concluded that poor income, poor socio-economic status and heavy energy demands of agrarian set up coupled with poor dietary intake and unhygienic living conditions were the major cause of poor nutritional status. Undernutrition in women has adversely influenced the nutritional status of children. Percentage of undernourished children and women were 65 and 60 respectively.

**CN.37 NUTRITIONAL STATUS OF ORPHAN ADOLESCENT GIRLS.** *Aruna Narayana and Jayasudha, Department of Nutrition, PSG College of Arts and Science, Coimbatore.*

Out of the total 49 teenage orphans girls selected, 27 per cent each belonged to 13 and 14 year group while 15, 16 and 17 year olds constituted 14 per cent each of the total. Majority of the orphans have been staying in the orphanage for less than two years. While family split was found to be the sole reason in 45 per cent of the teenagers becoming orphans, death of either or both of the parents due to accidents or unnatural causes was responsible in the rest. Average daily energy intake was roughly 50 per cent of RDA (ICMR, 1994). The protein intake was 30 g and 32 g for 13-15 and 16-18 year age groups respectively. Calcium intake was just 67.3% of RDA. The mean intake of iron was very high i.e., 171.9 per cent of RDA due to the consumption of ragi porridge for breakfast, mint chutney for dinner and greens poriyal for lunch during the survey period. Iron intake correlated positively with PCV (0.4693). The mean height of the girls ranged from  $131.8 \pm 8.89$  cms for 13 year olds to  $148.5 \pm 4.5$  cms for 18 years. The mean weight ranged from  $28.0 \pm 3.94$  kgs for 13 year old adolescents to  $40.5 \pm 5.26$  kgs for 17 year old girls. Common clinical forms of nutritional deficiencies observed were bitot spots, pale conjunctiva, dental caries and xerosis respectively. Energy balance computation showed only 19% had positive energy balance. The mean haemoglobin level of the sub-samples was found to be  $9.5 \pm 1.9$  g per cent. The mean packed cell volume was  $30 \pm 6.6$  and erythrocyte count was  $3.2 \pm 0.73$  millions/cu.mm respectively.

**CN.38 NUTRITIONAL PROFILE OF FEMALE ADOLESCENTS IN PERUMALKOVILPATHY AND NALLURPATHY TRIBAL SETTLEMENTS.** *Aruna Narayana and S Brinda, Department of Nutrition, PSG College of Arts and Science, Coimbatore.*

Out of the total 50 tribal adolescent girls selected from Perumalkoilpathy and Nallurpathy settlement areas in Coimbatore district, 42 percent were in the age group of 13-15 and the rest were from 16-19 year age category. Fifty per cent of the tribal teenagers work as agricultural labourers. Out of the rest, a meagre six per cent only are pursuing studies. The study revealed that the energy intake of the girls ranged from 2130 Kcal (13 years) to 3701 Kcal (19 years). The energy expenditure was between 1921 Kcal (13 years) and 2920 Kcal (19 years). While one third (32 per cent) of the selected girls exhibited negative energy balance, the rest (68 per cent) showed positive energy balance. Except iron and vitamin A, intake of all the other nutrients were equal to or above RDA in all the age groups. The mean height of the selected girls ranged from  $140.3 \pm 4.49$  cms to  $155.8 \pm 4.63$  cms and the weights from  $40.5 \pm 3.5$  kg to  $52.6 \pm 3.36$  kg. Dental caries was found to be more common with 60% of girls. Twenty per cent of the selected girls exhibited signs of B-complex deficiency.

**CN.39 NUTRITIONAL ANTHROPOOMETRY OF ADOLESCENT TRIBAL GRILS OF DHAR DISTRICT IN MADHYA PRADESH.** *Rajni Bafna and Priti V.Taneja, Dr. Baba Saheb Ambedkar National Institute of Social Sciences, Mhow, Madhya Pradesh.*

Adolescence is a period of significant physical growth. A well designed research study was carried out on 255 adolescent tribal girls aged 11-13 years of four blocks of Dhar District in Madhya Pradesh. In this paper the data obtained on nutritional anthropometry of these girls is being presented. These girls belonged to families of the lowest Socio-economic status and had never been to school. It was observed that the mean height of the girls at 11+ and 13+ year was  $129 \pm 3.59$ ,  $138.7 \pm 2.27$  and  $147.9 \pm 2.90$  cm and were 92.0%, 93.7% and 94.8% of NCHS standards respectively. The

mean weights of the girls were  $21.9 \pm 2.09$ ,  $25.5 \pm 2.16$  and  $30.3 \pm 3.15$  kg. at 11+, 12+ and 13+ years respectively and were 65.0%, 65.8% and 68.9% of the NCHS standards for each of these age groups respectively. This study highlights that these tribal girls were suffering from current malnutrition. There is need to evolve programmes to address the nutritional problems of these adolescent girls in remote tribal areas, in order to improve their nutritional status, keeping in mind their future role as a mothers in the family.

**CN.40 NUTRITIONAL PROFILE OF PRE-SCHOOL CHILDREN BELONGING TO BHIL TRIBE OF JHABUA DISTRICT IN MADHYA PRADESH.** *Nidhi Vaidya (Gupta)* and Preeti Taneja, Dr.Baba Sahib Ambedkar National Institute of Social Science, Mhow, Madhya Pradesh.

Children under six are the most vulnerable group of any community, more so among tribals. This study was aimed at studying the Nutritional Status of 706 Pre-school children (0-6 years) belonging to 430 Bhil Tribal families of Jhabua District in Madhya Pradesh. Information about birth order, weaning practices, family size were collected by Interview Schedules. Nutritional status was assessed through anthropometric and clinical examination of all the children. The data was analysed using the Indian Academy of Paediatrics Classification for interpretation and identifying the grades of malnutrition. The study showed that 29.8% and 21.6% children had moderate and severe malnutrition respectively. When children were grouped according to birth order, it was seen that 29.7% and 35.3% children in 1-2 and 3-4 birth order had suffered from moderate to severe malnutrition respectively. 40% of children who were fifth or still higher in birth order showed moderate to severe malnutrition. The highest levels of moderate (29.4%) and severe (31.6%) malnutrition were seen in children in the age group 6 months to 1 year. Thus the onset of malnutrition in majority of the children was during the first year of life reaching the peak around one year. This is due to ignorance about proper weaning and feeding practices which lead to nutritional inadequacies during Infancy.

**CN.41 NUTRIENT ADEQUACY OF RURAL FAMILIES IN SOUTH WEST REGION OF PUNJAB.** *B Sadana, C.K.Hira, M.Kaur and N.Singla*, Department of Foods and Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana.

A dietary survey was carried out in 160 families comprising a total population of 1023 individuals from four villages in south West Punjab during summer and winter seasons. The families belonged to landless, low (10 acres), medium (10-20 acres) and high ( $> 20$  acres) income groups based upon their land holdings. Per caput consumption of cereals in rural population ranged from 222 to 287 g/day. Average per caput energy consumption ranged from 1465 to 2101 Kcal while that of protein from 50 to 67.5 g/day. The cereals contributed to 38.3 to 67.7% of energy and 41.6 to 69.4% of protein and their contribution in the dietaries decreased with increasing income. Visible fat consumption constituted between 4.4 to 9.5% of total calories in various income groups. Intake of visible fat increased significantly ( $P < 0.05$ ) with increasing income but was not affected by season. Deficiency of energy, riboflavin and iron was observed in summer and winter season while intake of iron and vitamin A was low during summer season. Higher intake of protein, calcium and thiamine was observed as compared to ICMR's recommendations. Intake of iron,  $\beta$ -carotene, thiamine and ascorbic acid was not affected by income of the families whereas their consumption was significantly higher during winter season.

**CN.42 CONTRIBUTION OF FAST FOOD TO THE NUTRIENT INTAKE OF TEENAGERS.** *D Sadana and M Khanna*, Department of Foods and Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana.

The study was carried out on 250 adolescents (16-18 years) of both the sexes in Ludhiana and Jalandhar cities of Punjab. A questionnaire was developed to collect information regarding food habits, type and frequency of fast foods consumed. The dietary intake was also recorded using 24 hours recall method for 3 consecutive days. Results indicated that diets of teenagers for both the sexes were inadequate in terms of energy, protein, iron, vitamin C, riboflavin, niacin and folic acid. Per cent adequacy of energy in boys and girls was 79.5 and 81.6 respectively. Fast foods provided about 1/10th of the daily energy intake for the teenagers population studied. Calcium intake both in boys and girls was 2.25 - 2.60 times higher when compared with RDA. Fast foods contributed energy 9.5 and 9.4, protein 5.2 and 5.6 carbohydrates 7.6 and 8.1, fat 10.9 and 8.7% among boys and girls, respectively. Percent contribution of B-complex i.e., thiamine, riboflavin and niacin by fast foods to the total intake by teenagers surveyed was found to be negligible.

**CN.43 EFFICACY OF POSTNATAL NUTRITION COUNSELLING ON THE ANTHROPOMETRY OF RURAL LACTATING PUNJABI MOTHERS AND THEIR INFANTS.** *Rajbir Sachdeva, Kanchan Banga and Jasvinder K Sangha, Department of Foods and Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana.*

Sixty rural Punjab women aged between 18-33 years from low income group were selected during first month of lactation. The subjects were divided equally into Experimental (E) and Control (C) groups. Nutrition counselling was carried out in vernacular through lectures, demonstrations, visual aids etc. by individual and group contacts in the E group. The gain in weight and birth weight (BW) was 8.2, 2.84 kg and 7.2 and 2.3 kg. in both the groups respectively. The mean weight of the mothers during first and third month was  $45.6 \pm 1.7$ ,  $40.1 \pm 1.6$  and  $45.8 \pm 1.8$ ,  $40.3 \pm 1.9$  kg respectively. The mean weight during first and third month of infants belonging to E and C group was 2.84, 2.31 and 3.4 and 3.4, 3.1 kg respectively. The anthropometric parameters were significantly ( $P < 0.5$ ) greater for the subjects belonging to E group as compared to C group. Maternal weight and height were significantly ( $P < 0.01$ ) correlated to the infants' weight and height, the values of 'r' being 0.61 and 0.57 respectively. The data of the present study revealed that with the impact of nutrition counselling, the subjects of E group were convinced to ensure better nutrition by adopting better cooking and feeding practices. The poor anthropometry status could be due to low income, illiteracy, large family size etc. The nutrition counselling programme should be multipronged.

**CN.44 SEASONAL VARIATION IN THE FOOD INTAKE OF RURAL PUNJABI SCHOOL CHILDREN.** *Rita Jain, Kanta K Sharma and Leela Gupta*, Department of Foods & Nutrition, Department of Home Science Education & Extension, College of Home Science, Punjab Agricultural University, Ludhiana.

About 60 school children (equal number of boys and girls) of 10-12 years who volunteered were selected from four villages of Ludhiana district to study the seasonal variation in the food intake. One day's food intake in summer and winter was assessed by the weightment of duplicate portion of the food consumed. Mean  $\pm$  SD intake in terms of raw equivalent foods in summer and winter was (in g) : cereals  $204 \pm 59$  and  $206 \pm 57$ ; pulses  $28 \pm 26$  and  $20 \pm 22$ ; green leafy vegetables  $2 \pm 11$  and  $45 \pm 61$ ; other vegetables and fruits  $61 \pm 56$  and  $32 \pm 47$ ; roots and tubers  $30 \pm 27$  and  $54 \pm 60$ ; milk and milk products  $152 \pm 113$  and  $199 \pm 153$ ; sugar and jaggery  $27 \pm 13$  and  $32 \pm 13$ ; and fats and oils  $35 \pm 13$  and  $34 \pm 12$  respectively. The intake of green leafy vegetables and roots and tubers increased significantly in winter while that of other vegetables and fruits in summer. The per cent fulfilment with respect to balanced diets suggested by ICMR was inadequate for cereals, pulses, green leafy vegetables (except in winter for girls); other vegetables and fruits in winter; roots and tubers for girls in summer; total vegetables and fruits in summer; milk and milk products; sugar and jaggery; fats and oils for boys. The results reveal that the diets of rural children were inadequate despite the fact that overall Punjabi diets are supposed to be good in India. Hence, the diets need improvement particularly in summer for balanced nutrition.

**CN.45 NUTRITIONAL STATUS AND ANTHROPOMETRIC PROFILE OF PUNJABI RURAL PRE-ADOLESCENT GIRLS.** *Poonam Bakhetia and Rita Jain*, Department of Foods and Nutrition, Punjab Agricultural University, Ludhiana.

One hundred school girls in the age group of 10-12 years from villages Daad and Phulanwai of district Ludhiana, Punjab were studied. The food consumption survey was conducted by using 24 hour recall-cum-weightment method for three consecutive days. The height, weight, mid-upper arm circumference (MUAC) and triceps skinfold thickness (TSF) of the subjects were measured according to the methods suggested by Jelliffe (1966). The mean daily intake of other vegetables and milk and milk products were more than the suggested levels (123% and 126% respectively). The intake of cereals, green leafy vegetables and fats and oils was slightly lower, while for pulses, sugar and jaggery and fruits were significantly lower than the levels suggested for balanced diets. Except for energy ( $1818 \pm 65.6$  Kcal), vitamin A ( $257 \pm 21.8$   $\mu$ g) and riboflavin ( $1.0 \pm 0.04$  mg), the intake of all other nutrients were more than the RDA. As compared with the NCHS standards, the mean weight (81%), height (97%), MUAC (80%) and TSF (62%) were lower. The mean energy expenditure was  $1504 \pm 11.4$  Kcal, indicating a positive energy balance. However, subjects had positive and 32% had negative energy balance. Hence, the school girls need to improve food intakes both in quality and quantity in order to improve their health status.

**CN.46 PROFILE OF ANTHROPOMETRY OF RURAL SCHOOL GOING AND NON-SCHOOL GOING ADOLESCENTS.** *Kusuma DL and Philomena Royappa Reddy, Department of Home Science, SV University, Tirupati.*

The study was carried out in two drought prone mandals of Chittoor district in Andhra Pradesh. One thousand one hundred and eight rural, 10 to 16 years old girls comprised the sample for the present investigation. Five hundred and seventy two girls were attending school, while 536 girls were non-school going. A majority (64%) of the later group were school drop-outs at various levels of education. The selected anthropometric measurements made on these children were heights, weights, MUAC and skinfold at four sites viz., Biceps, Triceps, Subscapular and Suprailiac. Body Mass Index and sum of 4 skinfolds were also computed. The mean value of heights, weights, MUAC and 4 skinfolds registered by school going girls were higher than those observed for the non-school going girls. The differences observed between the groups were significant. However, all the anthropometric measurements when compared with the reference values were low for both the groups.

**CN.47 MATERNAL NUTRITION - A DETERMINANT OF PREGNANCY OUTCOME.** *Ranade AN, Rao Chobha and Yajnik GS'. Biometry and Nutrition Group, Agharkar Research Institute, Pune. 'KEM Hospital Research Centre, Pune*

In view of the recent hypothesis (Barker, 1994) about 'foetal origins of adult diseases, investigations on maternal nutrition in relation to phenotypes of birth have gained importance. In the present study rural pregnant women (n=400) from six villages near Pune were studied twice (18th, 28th week) during gestation for food and nutrients intakes and workload assessment. The study aimed to investigate the importance of pre-pregnant nutritional status as well as maternal nutrition during pregnancy in relation to outcome. As gestation was found to be significantly correlated with birth weight ( $r=0.58$ ) and length ( $r=0.50$ ), birth weight and height adjusted for gestation were considered throughout the analysis. Pregnant nutritional status especially lower weight and head circumference were associated with low birth weight with a relative risk (RR) of 1.6 & 1.3 respectively whereas additionally shorter mothers experienced high risk (RR = 1.94) of having shorter babies. Average nutrient intakes for energy and proteins, fats and iron were significantly lower at 18th wk (1773 Kcal, 45.1 gm, 35.7 gm, 18.4 mg) as well as 28th wk (1660 Kcal, 42.9 gm, 33.2 gm, 17.8 mg) as compared with recommended allowances. Assessment of workload showed that reduction in workload during gestation influenced favourably birth weight as well as length. Babies born to mothers whose intakes were adequate for calories and proteins were heavier (2688 g) and taller (47.6 cm) than those having either inadequate calories (2519 g, 47.5 cm) or proteins (2004 g, 47.0 cms). Further, lower % of energy from carbohydrates seem to pose high risk for low birth weight (RR = 1.20) whereas lower % of energy from proteins were observed to be responsible for shorter length at birth (RR = 1.17). Among the intra-pregnancy nutritional factors, calorie intake was closely associated with weight gain ( $r=0.22$ ) among only those women having better pregnant weights whereas weight gain was significantly associated with better weight and length at birth irrespective of pre-pregnant weight status. It is thus observed that nutritional intakes during pregnancy are indirectly correlated with the pregnancy outcome through weight gain.

**CN.48 ASSESSMENT OF NUTRITIONAL STATUS IN NAGPUR DISTRICT OF MAHARASHTRA STATE.** *VN Kargirwar, RP Rokade, Mehta and Chatargee, Bureau of Nutrition, Nagpur, Maharashtra.*

Studies on assessment of nutritional status often confined to under developed countries for the planning of nutrition education activity. This study was undertaken under UNFPA Family Welfare Area Project as district planning process for Microplanning the nutrition education activity for Management of Malnutrition in Nagpur district of Maharashtra. Study was conducted in 4 segments of district covering 871 households. This survey helps in identifying weaker areas of these 4 segments for management of malnutrition. Nutrition education activities are undertaken in these 4 segments.

**CN.49 FOOD HABITS IN SEMI ARID AREA OF RAJASTHAN.** *Madhu B Singh, KR Haldiya and J Lakshminarayana. Desert Medicine Research Centre, Jodhpur.*

A dietary survey was conducted in rural population of Jaipur District, representing a semi-arid zone of Rajasthan to investigate the various foods consumed by the local inhabitants. A total of 78 families were surveyed. Agriculture was the

principal source of income and food, followed by animal keeping and labour. Wheat and bajra are staple diet of this region, but the former constitutes the major proportion of the diet. In general, average daily consumption of different food items i.e., cereals and millets, pulses, fats and oils and milk, was found more in males than in females, in different age groups. In most of the age groups, the average nutrients intakes were found to be satisfactory in males than in females when compared with Recommended Dietary Intakes (RDA), as prescribed by ICMR. In general, vitamin A deficiency was more pronounced in all the age groups.

## 2. CLINICAL BIOCHEMISTRY AND NUTRITION

### **CBN.1 EFFECT OF ISAPGOL HUSK SUPPLEMENTATION ON SERUM CHOLESTEROL LEVEL, BLOOD PRESSURE, BODY WEIGHT AND DIGESTION IN ADULTS.** *Manisha Kale, Asha Mane and Vandana Mozariya. Post-Graduate Teaching Department of Home Science, Amravati University, Amravati.*

The study was carried out to compare the effect of isapgol husk supplementation on serum cholesterol levels, blood pressure, body weight and digestion in adults. Ten men and women between 35-60 years of age from Amravati city were selected. All subjects had total serum cholesterol level between 200-239 mg/100 ml (borderline risk sample). The study was divided into two parts of six weeks each. During the first phase, the subjects were on a low fibre diet. In the next 6 weeks, the subjects were advised to take one teaspoon of isapgol husk (5 gm) two times a day with water, after their major meals. The product was supplied to them free of cost and compliance was ensured. Estimation of total serum cholesterol level was done by one step method of Wybenga and Pileggi. Blood pressure and body weights were measured by standard procedures. Digestion was measured by scoring technique. Difference between low fiber diet and isapgol supplemented diet were observed in all parameters. In total serum cholesterol levels, it was 3.58 mg/dl, systolic blood pressure, it was 2.86 mm Hg and diastolic blood pressure it was 2.86 mm Hg. The difference on body weight was 1.93 kg and the digestion of the subjects fed on isapgol supplemented diet was good. It has been concluded that apart from its value as a non-irritant, harmless bulk forming laxative, isapgol husk on a large scale may become a cheap substitute to treat the risk factors of coronary heart disease. Further studies are necessary to confirm the above findings.

### **CBN.2 MACRO AND MICRO NUTRIENTS IN RELATION TO BLOOD SUGAR LEVEL OF CORONARY HEART DISEASE SUBJECTS.** *Sinha Mukul\* and Sharma Kanta K\*\*. Department of Foods and Nutrition, College of Home Science. \* RAU, Pusa, Samastipur. \*\* PAU, Ludhiana, Punjab.*

Macro nutrients like carbohydrates, fats and protein and micro nutrients like antioxidants have been the subject of much concern in promoting health and preventing coronary heart disease (CHD). In addition, high blood sugar levels or apparent diabetes increases the risk of CHD three folds. Therefore, the present study attempted to investigate an association between micro and macro nutrients and blood sugar levels. Serum glucose, lipid profiles and antioxidants levels of forty CHD subjects and twenty normal subjects matched for age and sex were measured by standard procedure. Fifty seven per cent of CHD had serum glucose levels above the risk value and 40% of them being diabetic. Their dietary intakes were recorded by the 24-hr recall-cum-weighment method. A significant difference was observed between energy, total fat, SFA, protein, cholesterol, fibre, calcium, phosphorus, iron and ascorbic acid intakes along with serum VLDL-C level and serum glucose level of diabetic and non-diabetic CHD subjects. A positive significant correlation of blood sugar with CHO, Protein, fat (SFA and Total), cholesterol and negative significance with serum HDL-C, ascorbic acid and vitamin E levels were observed in the 2 groups. Since all these factors are modifiable, it is suggested that the macronutrient intakes can be monitored and the antioxidant intakes increased at an early stage to reduce blood sugar levels and thus bring down the CHD incidence to one third.

### **CBN.3 VITAMIN A STATUS IN CHILDREN WITH DIARRHOEA.** *P Abrol, U Mehta, H Lal, B Arora. Pt BD Sharma Post-Graduate Institute of Medical Sciences, Rohtak.*

The study was conducted in 25 patients of each acute and persistent diarrhoea in the age group of 1-4 years. An equal number of matched controls were also recruited. Vitamin A status was estimated by serum vitamin A levels using the

fluorometric micromethod and conjunctival impression cytology. There was a higher prevalence of vitamin A deficiency in subjects who were less than 2 years of age. The impression cytology detected higher number of subjects with lower vitamin A status than serum vitamin A level. The study also found that conjunctival impression cytology was easy, non-invasive, painless and a safe technique. It could also be performed outdoors and did not require any sophisticated equipment. The study failed to find any causal relationship between decreased serum vitamin A level and xerophthalmia, in controls and cases of acute diarrhoea, but there was a significant difference in vitamin A status of controls and persistent diarrhoea patients.

#### **CBN.4 CURRENT STATUS OF IDD AND UNIVERSAL IODIZATION OF SALT IN THE UNION TERRITORY OF DELHI.** Pandav CS, Anand K, Mallik AK, Karmarkar MG, All India Institute of Medical Sciences, New Delhi

Though Delhi does not lie in the classical "Himalayan goitre belt", it was shown in 1980 that IDD is endemic in Delhi. A subsequent study reported in 1988, confirmed the IDD endemic status of Delhi. Following these reports, the sale of uniodised salt was banned from 1st June 1989. The aim of the present study was to determine the IDD prevalence in Delhi five years later. The study was cross-sectional and carried out among class VI students studying in the Government middle schools of Delhi. Thirty schools were selected on the basis of "probability proportion to size". A sample size of 1200 school children were thus included and urinary iodine estimation was done by wet ashing method. A total of 1684 school children were examined. The Total Goitre Rate (TGR) among the school children was 20.5%. The median urinary iodine level was 198 µg/l. As per the classification recommended by WHO/UNICEF/ICCIDD, Delhi, falls into mildly endemic area by clinical criteria and "no endemicity" by the biochemical criteria. When compared to the results from the previous surveys, it was observed that the IDD status using both clinical and biochemical indicators have declined in the last few years.

#### **CBN.5 GLYCEMIC INDEX OF SELECTED CEREALS.** Ireen L, Monika P, Rema S and Sail SS. PG Department of Home Science, Sardar Patel University, VV Nagar.

Glycemic Index (GI) ranks foods on the basis of their blood glucose response, its calculation is as follows :

$$GI = \frac{\text{Area under the 2 hr curve after 50 g carbohydrate (CHO) from test meal}}{\text{Area under the 2 hour curve after 50 g CHO from glucose}} \times 100$$

(Jenikins, *et al.*, 1981)

The GI of selected cereals prepared in the form of 'mutiya' a steamed and seasoned Gujarati preparation was determined. Experimental subjects (40-58 years) consisted of 6 diabetics (NIDDM) and 5 healthy males. For GI, subjects under fasting conditions (overnight) were fed either 50 g glucose or 50 g CHO from the test meal (66 g rice or 62 g ragi or 73 g wheat or 80 g wheat bran). Blood and urinary (qualitative) glucose were tested at 0, 1, 2 and 3 hours after feeding. The initial screening indicated that fasting plasma cholesterol and triglyceride levels as well as urinary glucose:N<sub>2</sub> ratio were higher in diabetics when compared to non-diabetics. Results indicated that GI in controls and diabetics were higher for rice (194 and 87 in controls and diabetics respectively) and ragi (125 and 85) and lower in wheat (62 and 72). Wheat bran showed a high GI in controls (129) and the least in diabetics (61). These findings have important implications for dietary control of diabetes.

#### **CBN.6 DIETARY AND SERUM CALCIUM LEVELS INFLUENCE ON BLOOD PRESSURE OF ADULT MEN AND WOMEN.** Lakshmi Janakamma K and D Peramma, Department of Home Science, S.V.University, Tirupati.

Association between blood pressure, dietary calcium intakes and altered calcium metabolism at cellular level are well established. The present investigation was carried out to study the influence of dietary calcium and serum calcium levels on the blood pressure of adult men and women (n=254) in the Indian context. The serum total calcium was estimated by atomic absorption spectrophotometry and free calcium was estimated with ion specific electrode. Three day dietary recall method was used to arrive at the dietary calcium intakes. The results revealed a significant positive correlation between diastolic blood pressure and total serum calcium levels. In addition, Ca<sup>+</sup> was positively correlated with dietary calcium

intake and total serum calcium (significant at 0.1% level). However, it was interesting to note that serum calcium levels and dietary calcium intakes had no influence on systolic blood pressure. It is known that dietary calcium intakes have a direct relationship to the serum free calcium levels which in turn influences the total calcium serum levels. Further investigations are required to understand the mechanism.

**CBN.7 COMPOSITIONAL CHANGES IN BODY FLUIDS OF DIABETIC PATIENTS.** *G Kochar and R Gulyani, Department of Food Science and Nutrition, College of Home Science, HPKV, Palampur, Himachal Pradesh.*

The study was conducted in two groups of subjects i.e., healthy and diabetic. Ten men and ten women volunteers were recruited in each group. The diabetics were about 20 years older when compared to the healthy subjects. The haemoglobin levels were significantly lower ( $P < 0.05$ ) in diabetics. The plasma protein was within normal range in all the subjects except in 3 males and 1 female diabetic subject. However, plasma glucose and cholesterol levels were significantly ( $P < 0.05$ ) higher in diabetics when compared to the healthy subjects. It is significant that for each of the parameters studied in the 2 groups, there were no differences between the 2 sexes. Though hyperzincurea was detected in all the diabetics, the saliva zinc content was lower in these patients. These differences were, however, not significant ( $P > 0.05$ ).

**CBN.8 IMPACT OF DIETETIC COUNSELLING ON KNOWLEDGE GAIN OF DIABETICS.** *L Anitha and D Peramma. Sri Padmavati Mahila Viswa Vidyalaya, Tirupati.*

In recent years, attempts have been made to simplify dietary regimes for diabetics in order to allow him/her to lead a normal healthy life. Despite these efforts and better diet counselling during last two decades, morbidity and mortality rates due to complications of diabetes have increased. These have been attributed to poor control of blood sugar levels and lack of adequate knowledge and communication among the doctors, dietitians and patients regarding dietary instructions. An investigation was therefore undertaken to study the impact of dietary counselling on knowledge gain of diabetics in high and middle income groups. Male subjects were contacted from local clinics between the age of 45 and 65 years. The subjects were given a few talks in the language preferred and the contents in the booklet was explained to their satisfaction. A sample menu was planned and demonstrated using the exchange lists and the concept of menu planning using the exchange lists was addressed. After a period of one month, a knowledge questionnaire was administered to both the groups [ $n=60$ ; High income group (Experimental) = 15; High income group (control) = 15; Middle income group (experimental) = 15; Middle income group (control) = 15] to find out the effect of counselling. Before counselling, a baseline information of their knowledge about diets was also collected. The results of the study clearly indicated that there was significant ( $P < 0.001$ ) knowledge gain due to counselling in experimental group as compared to control group, which did not receive any counselling. The results suggest that counselling helped patients understand the importance of fibre rich foods in planning diabetic diets and concepts of food exchange lists. The practical implications of the findings are discussed.

## POSTER SESSION - II

### 1. EXPERIMENTAL NUTRITION

#### EN.5 EFFICACY OF ZINC SUPPLEMENTATION IN REDUCING THE INCIDENCE AND PREVALENCE OF ACUTE DIARRHOEA - A COMMUNITY-BASED, DOUBLE-BLIND, CONTROLLED TRIAL. S Sazawal, P Dhingra, S Jalla, A Sinha, MK Bhan. Department of Pediatrics, All India Institute of Medical Sciences, New Delhi.

Inadequate dietary intake and diarrhoea, associated with negative zinc balance, may contribute to a zinc deficiency state, which can result in growth retardation and impairment of immune function. Each of these factors related to zinc nutriture, i.e., recent diarrhoea, malnutrition and impaired cellular immunity, have been found to be risk factors for diarrhoea in developing countries. We evaluated in a community-based, double-blind, randomized trial the effect of daily zinc supplementation on diarrhoeal morbidity. Children 6-35 months of age (n=609) were identified during acute diarrhoea and followed for 6 months after the recovery of diarrhoeal episode by household visits every fifth day. Children were randomly assigned to zinc (n=298) and control (n=311) groups and received supplement daily for 6 months. Zinc gluconate (10 mg elemental zinc) was given, with both zinc and control groups also receiving vitamins A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, D<sub>3</sub>, E and niacinamide. The primary outcome measures were the number of acute diarrhoeal episodes (incidence), and total diarrhoeal days (prevalence) during the 6 month intervention/follow-up period. Zinc supplementation had no effect in children 6-11 months of age. In children, >11 months there was a significant reduction in diarrhoea, but this was different in boys and girls. In boys more than 11 months old, supplementation resulted in a reduction of 26% (95% CI 13-38%) in diarrhoeal incidence and 35% (95% CI 20-50%) in prevalence. In girls, incidence was reduced by 17% (95% CI 2-30%) and prevalence by 19% (95% CI 4-47%). Overall, zinc supplementation resulted in a 17% decrease (95% confidence interval [CI] 1-30%) in diarrhoeal incidence in the children with plasma zinc levels <60 µg/dl at enrolment and a 33% decrease (95% CI 6-52%) in children with levels <50 µg/dl. We conclude zinc supplementation had a significant impact on acute diarrhoea morbidity in children more than 11 months old and in children with low plasma zinc concentrations.

#### EN.6 EFFECT OF FEEDING OF SIMAROUBA GLAUC (ACEITUNO) ON ALBINO RATS. SH Umadevi, MP Vaidehi, D Vijayalakshmi and ML Annapurna. Department of Rural Home Science, College of Agriculture, Bangalore.

The Simarouba glauca (aceituno) is a vegetable oil crop and kernels yield 62% oil. With the objective of increased utilization of this oil seed, the present study was conducted to evaluate its PER by feeding albino rats at 10% protein level. The weanling rats were fed four types of diets, namely, skim milk powder (control) - D<sub>1</sub>, simarouba raw seeds. D<sub>2</sub>, simarouba soaked and boiled - D<sub>3</sub> and simarouba soaked, boiled, dried and roasted - D<sub>4</sub>. The results showed that while there is a gain in weight in the control group, there has been steady reduction from the initial weight in D<sub>3</sub> and D<sub>4</sub> groups. All rats in D<sub>2</sub> died during first week of experimentation due to catarrhal enteritis. The histopathological results revealed toxic effects of simarouba on intestine and liver. The inflammation in liver suggested that its detoxification activity has been adversely affected by the test diets. It could be concluded that simarouba oil could be used in the diet as confirmed by the literature but consumption of whole seeds which are treated as in this study is unacceptable.

#### EN.7 EFFECT OF LOW FIBRE DIET ON FECAL EXCRETION AND SERUM LEVELS OF CALCIUM, PHOSPHORUS AND IRON IN ADOLESCENT GIRLS. Raj Bala Grewal, CM Bhat and AP Kaur. Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.

Nine healthy, non-anaemic college girls of 16-18 years old were selected and served moderate and low fibre diets. The low fibre diet was based on refined cereals, dehusked pulses, low fibre vegetables, eggs, milk and milk products. Food and fecal samples were collected for seven days each. The blood samples of the subjects were taken in post absorptive stage at the end of each feeding trial. The mean diet and nutrient intake of the subjects was almost the same during both trials except cellulose and fibre. There was a significant decrease in the excretion of calcium, phosphorus and iron and the absorption of these nutrients increased significantly ( $P < 0.01$ ) on the low fibre diet. The increase observed in serum calcium, inorganic phosphorus and iron levels was significant ( $P < 0.01$ ).

**EN.8 NUTRIENTS AND ANTNUTRIENTS OF MANGO KERNEL MEAL.** *Renuka P and Andallu B. Department of Home Science, Sri Satya Sai Institute of Higher Learning, Anantapur, Andhra Pradesh.*

The seed stones of mango (*Mangifera indica*) are considered as a waste and their disposal becomes a problem for the mango processing industries. In recent years, fat is extracted from the kernels of mango stones which is proved to be potentially edible and comparable to cocoa butter. Defatted meal is a byproduct of mango fat industry but its nutrient and antinutrient composition is not studied completely so far. Besides that the utilisation of mango kernel meal results in the total utility of mango stones which adequately compensates the cost of extraction of mango kernel fat. Though defatted meals generally are rich sources of energy and nutrients, the presence of antinutrients is limiting their usage. Present study was, therefore, undertaken to analyse mango kernel meal (MKM) for nutrients and antinutrients by using standard methods. This investigation revealed that MKM is comparable to cereals with respect to carbohydrate, protein and minerals especially calcium, iron and phosphorus. Like any other oil seed meal, it contains considerable amount of antinutrients such as oxalates, phytates, polyphenols, tannins and saponins due to which the meal is not suitable for consumption. Hence processing of the meal is essential which not only eliminates the antinutrients but also renders the meal a concentrated source of nutrients that are easily available to the body.

**EN.9 PALATABILITY AND PROXIMATE COMPOSITION OF STAPLE FLOUR BHAKKARI SUBSTITUTED WITH DIFFERENT LEVELS OF LEAD PROTEIN CONCENTRATE EXTRACTED FROM CAULIFLOWER LEAVES *BRASSICA OLERACEA*.** *Sandhya Joshi and Madhuri Bijwe. PGTD Home Science, Amravati University, Amravati.*

The FAO reckoned that in developing countries, about 20% of the people are undernourished. The most common deficiency is that of protein, resulting in high mortality rates. Among the inexpensive novel source of good quality protein, leaf protein has emerged as a promising source. Therefore, the present experiment was conducted to study the objectives mentioned in the title. Three types of bhakaries (local food preparation) were prepared using maize, jowar and bajra flours with 0, 5, 10 and 15 per cent LPC (extracted in the laboratory) substitution. A multiparameter numerical scoring system was developed and administered to specially trained panel of judges. Proximate composition of Bhakaris was estimated using AOAC. The results show that although, there was linear downward scoring when substitution was increased, the palatability was not lost upto 15% substitution. Maize bhakari had the maximum acceptance followed by jawar bhakari, bajra bhakari received the least scores. The protein content increased linearly as the substitution level increased. Furthermore, the economics showed that LPC is the cheapest source of good quality protein as compared to milk, meat, eggs, beans, dals and legumes. It is concluded that leaf protein could be used as a substitution in staple food preparations.

**EN.10 DO SPICES AFFECT *IN VITRO* PROTEIN DIGESTIBILITY OF PULSES ?** *Vani HP and Jamuna Prakash. Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri, Mysore.*

Spices are inherent part of Indian dietaries. They provide special aroma, taste, flavour and pungency to foods. One of the effects of spices is on the digestibility of foods. The present study was planned to investigate the effect of spices on *in vitro* protein digestibility in decorticated forms of bengal gram (*Cicer arietinum*), black gram (*Phaseolus mungo*), green gram (*Phaseolus radiatus*) and red gram (*Cajanus indicus*). The spices used were chilli (*Capsicum annum*), pepper (*Pepper nigrum L.*), coriander (*Coriander sativum*) and a mixture of these. Dhals were pressure cooked with 0.5% of freshly powdered spices and *in vitro* protein digestibility determined using pepsin and pancreatin enzymes by standard techniques. Samples without spices served as controls. The results reveal that protein content of dhals ranged from 20.5 to 23.0g%. The per cent protein hydrolyzed for the dhals without spices were 63.4 for bengal gram, 65.8 for black gram, 60.0 for green gram and 55.4 for red gram. Casein sample could be hydrolyzed to the extent of 78.8%. Chilli powder decreased digestibility significantly by 50, 78, 73, 60 and 69% in casein, bengal gram, black gram, green gram and red gram dhal respectively. Pepper exhibited a variable effect of altering the digestibility to 93% in casein and red gram dhal, 106% in black gram and green gram dhal and 98% in bengal gram dhal which were not significant. Coriander also decreased digestibility by 48, 76, 87, 77 and 73% and mixture of spices by 74, 91, 96, 96 and 82% in casein, bengal gram, black gram, green gram and red gram dhals respectively. It can be concluded that spices do influence *in vitro* protein digestibility in dhals to varying extent.

#### **EN.11 COMPARATIVE STUDY ON DRIED, FROZEN AND BOTTLED GREEN BENGAL GRAM (*Cicer arietinum*) IN TERMS OF PRODUCT QUALITY.** *Chandan Bala Mehta and Vibha Bhatnagar, College of Home Science, Udaipur.*

Green bengal gram is one of the important vegetable crops considering its nutritional and economical value. Preservation of green bengal gram is important. The present study was undertaken to compare the drying, freezing and bottling techniques of preserving green bengal gram in terms of nutrients and organoleptic acceptability. The moisture, protein, ascorbic acid, chlorophyll 'a' and 'b' contents of fresh green bengal gram were 71.5%, 24.0%, 26.86% mg%, 184  $\mu\text{g/g}$  and 68.75  $\mu\text{g/g}$  respectively. The unbalanced green bengal gram samples preserved by drying, freezing and bottling techniques showed significantly higher content of ascorbic acid, chlorophyll 'a' and 'b'. In case of protein, no significant difference was observed between various pretreatment in dried and bottled samples whereas in freezing technique, chemically blanched samples showed better results. With respect to organoleptic characteristics, maximum scores were obtained by unblanched dried and bottled samples while hot water blanched samples preserved by freezing scored maximum. Results further revealed that between all the three preservation techniques, freezing proved as the best method followed by drying and bottling techniques.

#### **EN.12 COMPARATIVE EFFICACY OF CONVENTIONAL VERSUS MODERN COOKING METHODS : VITAMIN C RETENTION AND PALATABILITY OF SELECTED VEGETABLES.** *Shahista Malik and Vibha Bhatnagar. Department of Foods and Nutrition, College of Home Science, Udaipur.*

It has been a long journey from cooking with firewood to cooking with modern gadgets like pressure cooking, electronic ranges and microwave ovens. However, before adding any cooking tool to the already vast repertoire and spending hard earned money on cooking devices, it becomes desirable to explore the utility and assess the effects of different cooking methods on nutritive value and acceptability of foods. The purpose of the present study was to investigate vitamin C retention and palatability of six different vegetables prepared by four cooking methods: boiling, futuro pressure cooking, microwave oven and solar oven cooking. A significant variation ( $P > 0.01$ ) was observed in vitamin C retention of vegetables cooked by different methods showing maximum retention in case of microwave cooked vegetables (31.75%), followed by futuro pressure cooking (27.89%), boiling (22.09%) and lastly in solar oven cooked vegetables (10.00%). Among vegetables, highest vitamin C retention was observed in cauliflower (56.82%), potato (32.01%), turnip (19.92%), spinach (17.80%), capsicum (9.49%) and least in cabbage (9.18%) cooked by different methods. The organoleptic acceptability of vegetables cooked by conventional boiling and microwave oven was found to be the best and next to these methods, pressure cooking was found better than solar oven cooked vegetables.

## **2. FOOD SAFETY AND CHEMISTRY**

#### **FSC.4 MICROBIOLOGICAL EVALUATION OF SOY-SPROUTS RABADI.** *Raj Bala Grewal, Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.*

Soybeans were soaked and germinated at 30°C for 36 h. Soy sprouts were dehulled, autoclaved, cooled and blended. To this, curd water was added and slurry of desirable consistency was prepared. The mixture was fermented in sterilized conical flasks at 25, 30 or 35°C for 12, 24 or 48 hr. Soy-sprouts rabadi salted to taste and fermented at 30°C for 12 h was most acceptable. The fresh soy rabadi fermented at different temperatures for different time was analysed for pH, titratable acidity, *lactobacilli*, yeasts, coliform bacteria and fungi. As fermentation progressed, pH decreased with increase in titratable acidity, *lactobacilli*, yeasts, coliform bacteria and fungi. Fungi was not detected. The number of *lactobacilli* cells increased at all the temperatures as fermentation progressed till 24 h and growth declined slightly after 48 h fermentation. The highest number of *lactobacilli* was found at 35°C followed in descending order at 30 and 25°C. The fermented product did not have fungal cells.

**FSC.5 CHANGES IN THE CONTENTS OF SOME ANTNUTRIENTS IN PIGEONPEA DUE TO DOMESTIC PROCESSING AND COOKING.** *Aarti Duhan, N Khetarpaul and S Bishnoi.* Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.

The level of phytic acid and polyphenols of high yielding pigeonpea cultivars varied from 857 to 917 and 1075 to 1328 mg/100 g respectively. Different domestic processing and cooking methods viz., soaking, dehulling, ordinary and pressure cooking and sprouting contributed significantly ( $P < 0.05$ ) in reducing the phytic acid and polyphenolic compounds in all the four varieties of pigeon pea. A reduction to the extent of 4 to 45 per cent in phytic acid and 4 to 30% in polyphenols was noticed in various processed and cooked cultivars when compared to uncooked samples. Maximum decrease in phytic acid occurred in germinated (48h) legume whereas pressure cooking of soaked-dehulled legume grains proved to be beneficial for lowering the polyphenolic contents.

**FSC.6 KEEPING QUALITY OF SHADE DRIED MUSHROOMS.** *Smitha Deshmukh\*, Asha Mane\*, Gangadhar Pusadkar\*\*.* \*PGTD of Home Science, Amaravati University, Amravati (MS). \*\*Shri Shivaji College of Agriculture, Amravati (MS).

Oyster mushroom (*Pleurotus sajar caju*) product is contributing to around 24% of the total production of cultivated mushrooms. As the storage life of fresh mushroom is 24 hours at room temperature, it is necessary to dehydrate when it is in plenty. The real season of Oyster mushroom cultivation starts in rainy season and ends in winter. During this period, there is dearth of sunlight. Therefore, cultivators are bound to dry them in indoor light. In the present investigation, an attempt was made to find out the keeping quality of chopped dried mushrooms. For this study, cultivation of *Pleurotus sajar caju* was taken in rainy and winter seasons. The fruity bodies, after harvesting, were chopped and dipped in potassium metabisulphite (0.2%), citric acid solution (0.2%) and salt solution (20%) for one minute and kept on strainer for 10-15 minutes, then spread on cotton cloth for drying. These dried mushrooms were packed in polythene bags. Observations of colour, texture and flavour were recorded after every fifteen days with the help of scores. The flavour, colour and texture was found to be acceptable till 45, 45-60 and 60 days respectively. The total acceptable period was 60 days. There was no significant difference in the storage life of dried mushrooms treated with potassium metabisulphite, citric acid and salt solution. Hence it is recommended that treatment is not necessary for keeping quality and dried mushrooms should be consumed within two months period.

**FSC.7 SHELF LIFE OF OYSTER MUSHROOM POWDER.** *Smitha Deshmukh, Asha Mane, Manisha Kale, SV Deshmukh.* PGTD of Home Science, Amravati University, Amravati (M.S.).

Mushroom powder can be most conveniently used in cookery as a flavouring and thickening agent. Besides, it enhances the nutrient content of food, if it is supplemented to bakery and other products. It can also be utilised in therapeutic diets. Therefore, to understand its maximum utility, an attempt was made to study the shelf life of mushroom powder. Oyster mushroom (*Pleurotus sajar caju*) cultivated and after harvesting were treated with potassium metabisulphite (0.2%), citric acid (0.2%), and salt solution for one minute, to study the shelf life. These processed mushrooms were then dried thoroughly in sunlight and powdered in mixer and packed immediately in polythene bags and kept under observation. The characters like flavour, colour and texture were studied after every 15 days with the help of scores. For each evaluation of shelf life, sealed pack was open and observations were noted. This whole process was repeated three times in order to check the reliability. The results concluded that the colour, flavour and texture remained in good condition till 75 days and there was no significant difference in the shelf life of mushroom powder processed with potassium metabisulphite, citric acid, salt solution and control samples. The mushroom powder should be consumed within 75 days for its delicacy. Hence it is recommended that mushroom can be dried directly without processing to prepare the powder and required amount for one single use should be packed in a packet. To increase the shelf life, further work on preservation using food additives are needed.

**FSC.8 STUDY OF THE SEED STORAGE PROTEINS FOR THE IMPROVEMENT OF GRAIN QUALITY FOR BETTER NUTRITION.** *MM Bapat and MD Patil,* The Institute of Science, Mumbai.

The requirements for proteins are expensive because of the increasing population. Seeds of cereals and legumes play a major role in supplying protein needs of people. To select a proper gene to improve the yield and quality of the grain by genetic engineering technique, it is essential to have a knowledge of structural and functional properties of storage

protein in question. Coarse grains play an important role in agricultural economy of India. Therefore, major storage proteins precipitable with 90% amm. sulfate saturation were studied from ragi and kulith. These proteins were glycoprotein in nature with Mol.wts 244 to 200 kD, sedimentation constants 12 and 11s; had acidic pl and different submit composition with Mol.wts. ranging from 76 to 29 kD. Proteins showed good score of all the essential amino acids except methionine and cysteine. From the structural analysis of these proteins with CD, UV and IR and from the amino acid composition, it could be concluded that ragi and kulith would be a good cereal-pulse combination from the nutritional point of view for the poor people. With the improvement in sulphur containing amino acids, these grains would help in amelioration of protein-malnutrition in large proportion of population.

#### **FSC.9 NUTRITIONAL QUALITY OF SOME NON-CONVENTIONAL GREEN LEAFY VEGETABLES.** Jasvinder

K Sangha, Jagtinder Kaur and Rajbir Sachdeva. Department of Foods and Nutrition, Punjab Agricultural University, Ludhiana.

Green leafy vegetables like Chinese cabbage (*Brassica perkinensis*), Gobhi sarson (*Brassica napus*), mustard (*Brassica juncea*) and Amaranthus (*Amaranthus viridis*) were selected through a market survey and subjected to sun-drying to make a comparative study of fresh and sun-dried leaves regarding their nutrient content. Among the four selected greens, mustard and gobhi sarson had the highest  $\beta$ -carotene content (6.11 mg/100 g). Ascorbic acid content of greens ranged from 21.86 mg (*Amaranthus*) to 54.64 mg/100 g (*Gobhi sarson*). Losses of  $\beta$ -carotene (50%) and ascorbic acid (75%) were found for all the vegetables due to sun-drying. Calcium content of the greens ranged from 1080 mg (*Gobhi sarson*) to 2950 mg/100 g (Mustard). Phosphorus content was highest in Gobhi sarson (225 mg/100 g) and lowest in amaranthus (155 mg/100 g). The losses of vegetables after sun-drying for calcium and phosphorus were not much as compared to  $\beta$ -carotene and ascorbic acid. Iron content of vegetables ranged from 32 to 78 mg/100 g. It was highest for mustard and lowest for Chinese cabbage. Iron losses after sun-drying were found to be ranging from 15 to 55%. Out of all the greens, mustard leaves were found to be the best from nutritional point of view.

#### **FSC.10 DIGESTIBILITY, AVAILABILITY OF NUTRIENTS AND ANTNUTRIENT CONTENTS OF PIGEON**

**PEA AND GREEN GRAM.** Sudesh Jood, Alka Sharma and S Sehgal. Department of Foods and Nutrition, CCS Haryana Agricultural University, Hissar

Food legumes such as pigeonpea (*Cajanus cajan*) and green gram (*Vigna radiata*) are the most important legumes grown in tropical and sub-tropical areas. Besides being major and less expensive source of protein, legumes also contribute appreciable amounts of several minerals. Despite a good nutritional profile, legumes have certain problems like presence of antinutritional factors which are known to reduce the bioavailability of nutrients. However, it is very important to constantly monitor the nutritional value of newly evolved cultivars so that the inferior ones may be discouraged for general cultivation. Keeping these facts in view, five cultivars of pigeonpea and six of green gram were analysed for their *in vivo* digestibility of protein, starch, *in vitro* availability of calcium and iron and antinutrients such as phytic acid, polyphenols and trypsin inhibitors. Significant varietal differences were found in contents of protein and starch digestibility and calcium and iron availability in all the cultivars of both the crops. Phytic acid content ranged from 877 to 1003 and 673 to 996 mg/100 g whereas polyphenols from 384 to 679 and 334 to 503 mg/100 g respectively. Trypsin inhibitor activity was found higher in all the cultivars of pigeonpea compared to green gram cultivars. Digestibility and availability (*in vitro*) of MH-91-2 of green gram and H-82-1 of pigeonpea was found to be better as compared to other cultivars. This may be attributed to their low content of antinutrients.

#### **FSC.11 NUTRITIONAL QUALITY, COOKING CHARACTER AND CONSUMER PREFERRED CHARACTERISTICS OF PIGEON PEA AND GREEN GRAM.** Sudesh Jood, Alka Sharma and S Sehgal.

Dept. of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.

Pigeonpea (*Cajanus cajan*) and green gram (*Vigna radiata*) are the two most important food legumes grown in tropical and sub-tropical areas. Food legumes provide the inexpensive source of protein in the vegetarian diet mainly in the developing countries. It is imperative to constantly monitor the nutritive value of new varieties being evolved by plant breeders so that those found to be inferior may be discouraged for cultivation. Keeping these facts in view, various newly evolved high yielding cultivars of pigeonpea and green gram were analysed for their proximate composition, consumer preferred and physico-chemical characteristics. A study was conducted in Hisar village by using questionnaire-cum-interview

method for collecting information on consumer preference. 80% of the farm families grow these pulses for sale and consumption purposes. They preferred the grains of cultivars of both pulses possessing typical characteristics like thin pericarp, better dal recovery, light colour, less cooking time. Significant varietal differences were observed in protein, fat and moisture content and their physico-chemical characteristics (density, hydration capacity, hydration index, swelling capacity and swelling index). Cooking time of all the cultivars of pigeonpea and green gram also varied significantly and ranged from 80 to 122 and 65 to 109 min respectively.

#### **FSC.12 COMPOSITION, PRODUCT DEVELOPMENT AND ACCEPTABILITY OF SWEET POTATO.**

*Akkamahadevi P and Meera Rao. College of Home Science, University of Agricultural Science, Dharwad.*

Sweet potato culture of five varieties, Srivardhan, Belgaum local, I-57, CI854-13 and Vikram (control) grown at the Main Research Station, University of Agricultural Sciences, Dharwad, were analysed for composition during 1995-96. Sweet potato was utilised in various traditional, dehydrated products to see their acceptability. In 100 g sample of sweet potato varieties, moisture ranged between 76.57 and 79.40, protein was 3.73 and 8.63, fat was 0.47 and 1.03 and crude fibre was 0.63 and 0.94. All samples showed significant difference at 5% level except for ash which ranged between 4.42 and 4.55. Starch (71.66 to 84.66), total sugar (5.35 to 16.99) and reducing sugar (0.53 to 1.62) varied between varieties on dry weight basis. The ascorbic acid content of varieties ranged between 16.13 and 23.42 mg per cent. Acceptability of dehydrated products, vermicelli, *gavali*, *sandige* (substituted with 50% sweet potato flour) and sweet potato chips showed that texture and flavour did not differ significantly from control. Colour of the products was slightly brown and the taste was sweetish. All the products were found to be acceptable in the reconstituted form compared to the standard traditional recipes.

#### **FSC.13 STREET FOODS - COMPOSITION AND MICROBIOLOGICAL PROFILE. LA Uma, GS Sharada, Meera**

*Rao and RK Naik. College of Home Science, University of Agricultural Sciences, Dharwad.*

Among the 60 to 70 types of street foods vended in Dharwad city during the year 1994-95, five popular items namely, *Chigali*, *Chikki*, *Dry rasgulla*, *Bhaji* and *Milk lolly*, procured from the vicinity of cinema halls and schools were selected for chemical and microbiological analyses. The food samples differed significantly with respect to moisture, protein, fat, ash and energy contents. The computed calorific values and the per rupee availability of protein, fat, energy and carbohydrate was higher in *Chikki*, *Dry rasgulla* and *Bhaji* than in *Chigali* and *Milk lolly*. Total bacterial counts and the two food borne pathogens - *Escherichia coil* and *Staphylococcus aureus* were highest in *Milk lolly*. In *Chikki*, *Dry rasgulla* and *Milk lolly*, the association of moisture content, total bacteria, *Ercherichia coil* and *Staphylococcus aureus* counts was significant. Irrespective of the nutrients content, all the selected street foods harboured the food borne pathogens, thus making them hazardous for human consumption. Education of the public health personnel, street vendors and consumers are important to reduce the risks of food borne illnesses in future.

### **3. OTHER CATEGORIES**

#### **OC.8 QUALITY CHARACTERISTICS OF INDIAN MILLED COMMERCIAL FLOUR AND SENSORY EVALUATION OF BREAD FROM SELECTED BAKERIES. Jemima B Mohankumar and N Arthi. Department of Nutrition and Dietetics, PSG College of Arts and Science, Coimbatore.**

The quality characteristics of Indian milled commercial flour pertaining to (moisture, content, gluten content, ash content, sedimentation value, protein percentage) used in 20 selected bakeries (ten in Tirupur and ten in Coimbatore) were analysed and the sensory characteristics of bread were evaluated using a 5-point score card by experienced panellists. The moisture content (12.5%), dry gluten content (9.4%), wet gluten content (25.9%), ash content (0.55%), sedimentation value (19 ml) and protein percentage (11.2 g%) of the flours were within the limits of the values specified by the BIS for bread flour and thus it was found that bakeries used flour highly suitable for bread making. All the selected bakeries used almost the same ingredients for the manufacture of bread with a slight variation in the bread improvers. The bread prepared at the selected bakeries were not of uniform quality and had varied nature of crust colour, crust texture, bread texture and appearance and chewing quality though they were prepared from flour of almost similar quality. Loaf weight (X 425 g)

and loaf volume (X 447 cc) were highly varied among the bakeries. Bread obtained from bakeries with popular brand names were only highly acceptable whereas other local bakeries product breads were only just acceptable in nature. With regard to production rate, it was found that best quality breads though costlier were highly preferred by the common masses and thus were produced in larger quantities.

## OC.9 ASSOCIATION OF BODY MASS INDEX, WAIST HIP RATIO AND TRICEPS SKIN FOLD TO THE INCIDENCE OF DIABETES MELLITUS AND CARDIOVASCULAR DISEASES *Rema N. Parvathi Easwaran*

P and Kalpana N, Department of Food Service Management and Dietetics, Avinashilingam Deemed University, Coimbatore.

In the etiology of *diabetes mellitus* and cardiovascular diseases, the two major non-communicable diseases of the world, obesity plays an important role, precipitating the disease by interacting with other factors, namely, family history, dietary habits and lifestyle factors. The present research was towards assessing the degree of obesity through Body Mass Index, Waist Hip Ratio and Triceps Skin Fold in 304 diabetic and 328 cardiac patients of five hospitals of Coimbatore who attended the out-patient wards over a period of two months. The food intake was quantified through a 24-hour recall for three consecutive days. Information regarding socio-economic status, medical history and lifestyle practices were collected using an interview schedule. For a sub-sample of 75 each of diabetic and cardiac patients, blood glucose and lipid profile were estimated respectively. As age increased, Waist Hip Ratio increased in both diabetic and cardiac patients while Body Mass Index and Triceps Skin Fold were not significantly on the increase. Family history of the patients revealed 72 and 64 per cent of diabetic and cardiac patients respectively had first degree relatives as patients. Smoking and drinking alcohol aggravated complications and were also positively associated with Body Mass Index and Waist Hip Ratio. Positive association was observed between fasting blood glucose and Waist Hip Ratio and Body Mass Index in diabetic patients and lipid profile and Waist Hip Ratio and Body Mass Index in cardiac patients. Fat, energy and carbohydrate intake were associated with blood glucose and total cholesterol and LDL cholesterol and inversely to HDL cholesterol. A risk assessment index was formulated using the above associations to be used for screening patients.

## OC.10 STUDIES ON UTILIZATION OF SOYBEAN FLOUR IN SOME INDIAN TRADITIONAL RECIPES. *Raj Bala Grewal and Rajesh Duhan. Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.*

Soybeans were processed to prepare full fat soyflour. Fresh soyflour contained 37.82, 20.15 and 5.06 per cent protein, fat and ash content, respectively and appreciable amount of calcium (190 mg/100 g), iron (10.83 mg/100 g) and zinc (6.29 mg/100 g). Soyflour was incorporated (25, 35 or 50 per cent) in several traditional recipes viz., *Chapati, Paratha, Puri, Kofta, Vadas, Pura* and *Golgappa*. All these products were evaluated organoleptically by a panel of 10 judges using 9-point hedonic scale. It was found that incorporation of soy flour upto 50% did not affect colour of the products adversely. Colour was desirable in all these products prepared with 25 or 35 per cent soy flour supplementation, differences were significant ( $P < 0.05$ ) with further increase in soy flour incorporation to 50 per cent in most traditional products except soy pura. Similarly, aroma of these traditional products was not affected with the increase in supplementation of soy flour from 25 to 35 per cent. Further increase in supplementation i.e., 50% decreased the scores of aroma of *chapati*, *soy puri*, *soy kofta* and *soy vadas*. Aroma of these products was found to be moderately desirable to desirable. The study indicates that properly processed soyflour can be successfully incorporated upto 35% in several Indian traditional foods.

**OC.11 MICROBIOLOGICAL SAFETY OF MILK AND MILK PRODUCTS.** *S Uma Maheshwari and E Kavitha, Department of Food Service Management and Dietetics, Avinashilingam Deemed University, Coimbatore.*

The nutritious food, milk, unfortunately is a splendid food for bacteria and other pathogens. The consumption pattern of milk and its products vary in the urban and rural areas. While cow milk is popular in rural area, toned milk supplied by co-operative and private dairy is popular in urban area. Refrigerated storage of milk was popular both in urban and rural areas. Curdling was the common type of milk spoilage seen in both areas. Curd was prepared at home in majority of urban and rural households and was mainly stored in refrigerator. The main source of purchase of butter and ghee was from retail shops and was mainly stored in refrigerator. Marketed cheese, paneer and khoa were popular among the urban households. HTST method of pasteurization and automatic packaging was followed in the dairy plants. The standard plate count and coliform count of pasteurized milk met BIS standards while that of vendor and farm milk did not meet the BIS standards. *Salmonella* was absent in all three sources. Boiling of milk reduced the standard plate count greatly irrespective of initial

count. SpC and coliform count of household and vendor curd were extremely high and did not confirm with the ISI standards.

**OC.12 ASSOCIATION OF SMOKING TO SELECTED CLINICAL PARAMETERS AND WORK OUTPUT AMONG WORKERS IN A PUBLIC SECTOR UNIT.** *Anuradha and C Gayathiri. Avinashilingam Deemed University, Coimbatore.*

The changes in dietary habits and nutrient intake of smokers may affect the work output and productivity which plays a significant role in the development of a country. Hence, this study was taken up to evaluate the association of smoking to selected clinical parameters and work output among workers in Bharath Heavy Electricals Limited, Hyderabad. Twenty five smokers and 25 non-smokers were surveyed for their socio-economic status, dietary habits and life style and clinical parameters. Work output and nutrient intake of ten smokers and ten non-smokers were correlated. The work output was analysed using the standard put forth by BHEL. Work output of the smokers was distinctly lower than that of non-smokers. Smoking had a significant correlation with selected clinical parameters. There was positive correlation between intake of iron and work output.

**OC.13 TRYPSIN INHIBITOR ACTIVITY OF PIGEON PEA AS AFFECTED BY PROCESSING AND COOKING METHODS.** *Aarti Duhan, N Khetarpaul and S Bishnoi. Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar.*

Raw unprocessed seeds of pigeon pea cultivars viz., UPAS-120, Manak, ICPL-87 and ICPL-151 contained varying amounts of trypsin inhibitor activity i.e., 1007 to 1082 TIU/g. The pigeon pea seeds were subjected to soaking for varying periods (6h, 13h, 18h), soaking (12h) and dehulling, ordinary and pressure cooking of unsoaked, soaked (12h) and soaked (12h), dehulled seeds and germination for different periods i.e., 24, 36 and 48h. All the processing and cooking methods could bring a significant decline in trypsin inhibitor activity of pigeon pea. In pressure cooked legume seeds, trypsin inhibitor activity could not be detected as it was almost completely eliminated. Soaking and dehulling could remove about 93% of trypsin inhibitor activity. Minimum decrease was due to soaking (6h) in UPAS-120. However, pressure cooking and ordinary cooking of soaked-dehulled seeds were one of the potential methods for removal of trypsin inhibitor activity and improvement of protein digestibility.

**OC.14 HEALTH STATUS OF PREGNANT WOMEN OF HISAR CITY.** *Salil Sehgal and Asha Kawatra. Department of Foods & Nutrition, CCS Haryana Agricultural University, Hisar.*

Pregnancy is a crucial period in a woman's life. The health of the pregnant woman has a great bearing on the nutritional status of her offspring. Keeping this in view, a study was undertaken on 50 pregnant women to assess their health status. Most of the women were in the age group of 25-30 years. It was second pregnancy in majority of the cases (70%). Most of the pregnant women had normal weight at the start of pregnancy and gained about 9-10 kg of weight at the end of pregnancy. Fifty per cent of pregnant women complained of nausea and vomiting during the first trimester of pregnancy. At the start of 2nd semester of pregnancy, majority of the women (78%) were consuming the same pre-pregnancy diet and only 12% had increased the intake of green leafy vegetables, fruits, milk and cereals. The remaining 10% respondents increased the intake of milk and cereals only. The haemoglobin level ranged from 10.5-11.5 g/100 ml in majority of women. Sixty per cent of respondents were taking iron and folic acid tablets regularly as prescribed by the doctors. Majority of respondents (74%) were visiting hospitals on monthly basis till 2nd trimester of pregnancy while 68% visited the hospital weekly for medical check-up in the last trimester of pregnancy. Only 28% of pregnant women complained of weakness and 8 per cent had developed oedema in the lower limbs. All the pregnant women had positive attitude towards their prospective motherhood.

**OC.15 CONTENT ANALYSIS OF NUTRITION AND HEALTH INFORMATION IN MASS MEDIA.** *K Sheela and V Pushpa. Department of Rural Home Science, University of Agricultural Sciences, Bangalore.*

Nutrition and health education programmes have been in operation and communicated through several media like traditional folk media to modern satellite communication channels to reach millions of people. In the present study, an investigation was carried out to assess the content and frequency of the subject matter regarding nutrition and health

information in selected media. Content analysis of selected mass media was done for 3 months to know the type of message and their frequency of appearance or the space provided for dissemination of nutrition and health information. Newspapers published less information on nutrition and health. In magazines, more number of feature articles appeared on nutrition than on health aspects. In electronic media, it was observed radio has given equal importance to information on health and nutrition while in television, there was less information on nutrition and also the frequency of telecast was less. It was observed that emphasis is not given in the mass media during the study period, to information on basic facts about nutrients, value of various foods and the correct methods of cooking which is of much concern in the present situation.

#### **OC.16 RELATIVE EFFECTIVENESS OF TWO TEACHING METHODS USED IN NUTRITION AND HEALTH EDUCATION.**

*K Sheela and PN Mamatha.* Department of Rural Home Science, University of Agricultural Sciences, Bangalore.

The magnitude and implications of malnutrition among the vulnerable sections of the population throughout the country call for urgent action. Among various strategies imparting nutrition and health education to the people and convincing them to adopt desirable food habits appear to be practical and effective in the long run. The present study was aimed to determine the effectiveness of two different teaching methods used. Lecture and demonstration and lecture + demonstration + audio-visual aids. The total sample size of the mothers in the study was 120, out of whom 40 belonged to control group who did not have any exposure to nutrition and health education, 40 mothers received nutrition and health education through lecture + demonstration and 40 mothers received education through lecture + demonstration + audio-visual aids. Nutrition and health education helped mothers to improve their overall nutritional and health knowledge, attitude and practices. When relative effectiveness of two teaching methods was determined, the mothers who received nutrition and education through lecture + demonstration + audio-visual aids had better nutritional and health knowledge and attitude when compared with mothers who received nutrition and health education only through lecture + demonstration. But there was not much significant difference between the overall mean score for nutritional and health practices among two experimental groups.

#### **OC.17 GUIDELINES IN FITTING PB MODELS TO STATURE GROWTH AMONG RURAL INDIAN ADOLESCENT BOYS.**

*Joshi SB, Kanade AN and Rao S.* Biochemistry and Nutrition Unit, Agharkar Research Institute, Pune.

Preece-Baines (PB) model is most popular model for describing adolescent growth. However, most of such models were developed using individual data on healthy population. Therefore, fitting these models to describe growth data of rural undernourished children not only needs consideration about their applicability but also demands guidelines for choosing the appropriate initial estimates. For, it is known that such models, especially PB model, may wonder (or not converge) in the absence of appropriate initial estimates. Present study used the longitudinal data on 100 rural boys in the age group (10-17 years) having 7 to 17 serial observations on each individual. Analysis suggests that for individual fitting, choosing appropriate NCHS percentile nearest to the growth curve of an individual is essential. Estimates obtained by fitting PB model to this chosen NCHS percentile values are observed to be appropriate for using as initial estimates in fitting the model. Model was fitted successfully by using such initial estimates in case of 80% boys. It was observed that the rate constants viz., SO and S1 were most sensitive parameters and were correlated with the age at Take-off (ATO). Similarly, adult height was observed to be correlated with height at PHV which in turn was associated with height at take-off (HTO). This signifies the importance of better nutritional status at take-off for better adult heights. Lastly, study examines the adequacy of the model for describing growth from group data as most of the studies are of cross-sectional nature. Estimates for mathematical as well as biological parameters obtained by fitting model to group median values were not significantly different than those obtained by individual fitting. This suggests applicability of model to group medians which would be helpful for comparing two communities/groups. Thus study offers some useful guidelines for fitting model and its application for describing stature growth of undernourished children.

#### **OC.18 THE IMPACT OF NUTRITION EDUCATION.**

*Nilima Verma.* Department of Home Science (Foods and Nutrition), Government MLB Girls PG College, Bhopal, Madhya Pradesh.

A large part of urban population consists of migrants of whom, a substantial portion live as squatters-in slum. Slum dwellers are caught between ignorance and high aspirations whereby, their priorities lack justification because they originate

from the urban elite. This results in further deterioration of health and nutrition. Hence it is very necessary to impart nutrition education to the slum-dwellers if we want to move in a positive direction towards health. The study was designed with simple techniques of nutrition-education to slum women of Bhopal city.

The dietary pattern of slum dwellers was studied so that their nutritional status may be revealed and possible remedial measures could be suggested to counter malnutrition and undernutrition. The study was conducted in slum women to assess the effectiveness of three different methods of delivering nutrition education i.e., by lecture cum leaflet, cooking demonstrations and drama. Females had significantly more negative nutrition attitude and behaviour and thus education level was related to their nutrition knowledge and attitudes. Though education by all the three methods - Lecture-cum-leaflet, drama and demonstration were effective in changing the attitudes and nutrition behaviour of slum women, but demonstrations method was significantly more effective in behaviour change, the ultimate goal of nutrition education interventions. Demonstration method not only highlighted the important nutrition present in the food but also made them understand to prepare nutritious recipes at low cost. Thus nutrition education is one of the most effective technique which brings about positive change in the nutritional status of the slum dwellers, specially pregnant women and children. Therefore, educational programmes must be launched not only through grass root level worker but also by using appropriate mass media.

**OC.19 INFLUENCE OF DIETARY HABITS ON GALL BLADDER DISEASE.** *Nilima Verma*. Department of Home Science (Foods & Nutrition), Government MLB Girls PG College, Bhopal, Madhya Pradesh.

The incidence of gall-bladder disease is common in India. It is observed that due to marked dietary differences, this disease is 5 to 7 times more prevalent in North-India than in South-India. The most common form of gall bladder disease is cholelithiasis [gall-stones (GS)]. Majority of GS in India are composed of cholesterol, occurring two times more often in females over 40 years of age. Dietary factors play a main role in aetiology of GS; high cholesterol diet, lack of dietary fibres and insufficiency of PUFA have been found to increase GS. A survey was conducted on the patients who had undergone cholecystectomy and an equal number of age, socio-economic status, veg/non-veg matched controls. It was observed that four "F" were present in the patients having GS - forty years age, female, fatty diet and fasting. There are many factors that have an important role in the progression of GS which in turn may be influenced by diet. GS is commonly related to life-style, in particular, to dietary habits. So nutritional strategies for the management of GS are needed to be studied. The patients were under medical and dietary treatment and 80% patients responded well to the modified diet prescribed by the doctor/dietitian. The management of GS has significance in understanding the benefits and limitations of available techniques to avoid unnecessary surgery and to plan treatment for prevention of GS. Thus, it is recommended that low-fat diet, high fibre, reduced cholesterol and excessive intakes of fluids may be beneficial to the patients of GS.

**OC.20 STORAGE CONDITIONS OF DIFFERENT PULSES IN BIHAR.** *Usha Singh<sup>1</sup> and BNP Singh<sup>2</sup>*. <sup>1</sup>Department of Foods and Nutrition, Rajendra Agricultural University, Pusa. <sup>2</sup>Faculty of Social Science, BBA, Bihar University, Muzaffarpur.

A study conducted in Northern region of Bihar reported that redgram, greengram, lentil and bengalgram are the commonly cultivated pulses. Among the redgram growers, about 81.36% stored the produce ranging from a few weeks to one year. Less than half of them used insecticide as a prophylactic measure. One third of the respondents storing redgram reported insect infestation. About 22.92% respondents having redgram in store did not use any insecticide. However, there were at least 8.33% respondents who reported infestation in spite of using insecticides. Since greengram, lentil and bengalgram were cultivated in small quantity, the problem of storage was less. About 84.09% of greengram growers need to store the produce and only 21.62% respondents who stored greengram used insecticide. Infestation was reported by few farmers in spite of the use of insecticides. A large number of lentil growers (71.43%) needed to store it. None applied insecticide as prophylactic measure. Only one respondent reported insect infestation.

**OC.21 STUDIES ON PEST CONTROL MEASURES OF INFESTED PULSES.** *Usha Singh<sup>1</sup> and BNP Singh<sup>2</sup>*. <sup>1</sup>Department of Foods and Nutrition, Rajendra Agricultural University, Pusa. <sup>2</sup>Faculty of Social Science, BBA, Bihar University, Muzaffarpur.

In India, pulses are stored at household level. Due to improper storage conditions, infestation occurs which leads to qualitative and quantitative losses. A study carried out in North Bihar reported that farmers take a number of measures

to kill the insects once the grain is infested. Among all pest control measures, sundrying (94%) is in maximum use followed by application of insecticides (41%), roasting (3%) and dhal preparation (2%). Almost all respondents are aware of the harmful effects of consumption of infested pulses. Even the severely infested grains are processed into dhal and used because of its high cost. In case of severely infested grain, there is wastage in dhal in the powder form and thus the total recovery of dhal declines. The consumption of these infested dhal causes toxicity and gastrointestinal disturbances. Out of 90 respondents reporting gastrointestinal disturbances, gas problem was found in 87 respondents' family (96.6%). Indigestion and diarrhoea were observed in two and one family respectively. In case of severity, these problems result in mortality.

## **OC.22 ROLE OF NUTRITION EDUCATION IN EFFECTIVE MANAGEMENT OF DIABETES.** *Sunanda Itagi and V Gaonkar. College of Rural Home Science, University of Agricultural Sciences, Dharwad.*

The goals of management in diabetes include normal growth and development, control of blood glucose, maintenance of optimal nutritional status and prevention of complications. Diabetes nutrition education is a continuous process that can be viewed in five stages : nutrition assessment, planning, implementation, evaluation and updating the care. The present study was carried out on 142 registered patients in out-patient section of diabetic clinics over a period of 15 months. Majority of them (79%) overweighed with BMI ranging from 25-29. Dietary counselling was offered on an individual basis following nutrition assessment which covered detail dietary history, anthropometric measurements, occupation, type of medication, exercise, hypoglycaemic agents taken, food habits and life style. Planned sample menus were given to patients according to their needs. About one-third of the patients attended regular follow-up programme where meal-plan adherence was evaluated. Among them normoglycemia was attained by 70% and the remaining showed moderate range of blood sugar control. Therefore, it was found necessary to promote continuity of learning and updating dietary knowledge of patients in overall management of diabetes.

## **OC.23 PREVALENCE AND ETIOLOGY OF IODINE DEFICIENCY DISORDERS IN TARAI REGION.** *Monica Tandon, Sangeeta Kulshretha and RS Raghuvanshi. Department of Foods and Nutrition, GB Pant University of Agriculture & Technology, Pantnagar.*

Iodine deficiency manifested by endemic goitre, cretinism and other disorders continue to be a major public health problem in India. In spite of various preventive measures taken to control iodine deficiency disorders (IDD), the problem still remains unabated. The purpose of the present study was to identify the prevalence of goitre in Pantnagar and nearby areas and to study the etiological factors leading to IDD. The study was conducted in three phases. First phase included general survey of the families residing in and around Pantnagar region. In second phase, on the basis of phase I results, 10 to 12 years age group children were selected from four schools and were examined for goitre grade and urinary iodine excretion. Finally, in third phase, the etiological factors leading to IDD were studied. The etiological factors studied were iodine content of soil, water and food samples, salt iodine content, hygiene and sanitary conditions, socio-economic status, educational status of parents and the dietary survey. The general prevalence of goitre in phase I was found to be 34.5 per cent. In 10 to 12 year age group children, the prevalence was 38.9 per cent. On the basis of urinary iodine excretion, subclinical deficiency was found in number of children without having goitre. Twenty six per cent of salt samples were found to have less than the recommended levels of iodine at consumer level. The iodine content of artesian well and hand pump water was 0.0076 and 0.0064 ppm. Farm oil where cereals, pulses and oilseeds were grown had more iodine content (16.0 ppm) than kitchen garden soil (9.1 ppm). Iodine content of food samples ranged from 0.10 to 13.33  $\mu\text{g}/100\text{ g}$  on fresh weight basis. Average energy, protein and iodine intake was more in non-goitrous subjects than their goitrous counterparts. Hygiene and sanitary conditions correlated significantly with goitre and urinary iodine excretion. Most probable number (MPN) count of *E. coli* in drinking water of the region was thousand fold higher than the ISI standards. The goitre prevalence was found to be highest in the lower socio-economic group and the families where parents had poor educational status. Finally, the calculated values of multiple regression equation revealed that in the present environmental conditions, salt iodine content of 15 ppm at consumer level was inadequate to maintain urinary iodine excretion of 100  $\mu\text{g}/\text{l}$  in children.

**OC.24 DISTRIBUTION OF BODY MASS INDEX IN PATIENTS WITH CORONARY HEART DISEASE.** *Sinha Mukul\* and Sharma Kanta K\*\*. Department of Foods and Nutrition, College of Home Science. \* RAU, Pusa, Samastipur, Bihar. \*\* PAU, Ludhiana, Punjab.*

Coronary Heart Disease (CHD) is a rapidly growing problem in the developing countries. Overweight and obesity predisposes to CHD and other associated risk factors of CHD like diabetes and hypertension. Body Mass Index (BMI) is one of the ways of measurement of body composition. To study the distribution of overweight and obesity in CHD patients, forty hospitalised patients diagnosed for the first time after a heart attack (85% male and 15% female) and twenty (normal) age and sex matched controls were selected. The BMI was calculated from the height and weight data and graded as chronic energy deficient (CED)  $< 18.5$ , normal between 18.5 - 25 and obese  $> 25$ . The data analysis revealed that amongst CHD and normals 7.5 vs 5% were CED, 55 vs 70 normal height and 37.5 vs 25% were obese. The BMI in the risk factor groups of diabetic and hypertensive were compared. No significant difference was observed between BMI of CHD vs normal, diabetic vs non-diabetic CHD subjects and hypertensive vs nonhypertensive CHD subjects. BMI correlated positively with energy, fat intake and body weight but not with lipid profile. It may be concluded that among Indians, CHD can be associated with low BMI.

**OC.25 MATERNAL HEALTH OF BHIL WOMEN IN JHABUA DISTRICT OF MADHYA PRADESH.** *Manisha Saxena, Paiti V Taneja. Dr. Babasaheb Ambedkar National Institute of Social Sciences, Mhow, Madhya Pradesh.*

The study was carried out on Bhil tribal women in Jhabua district of Madhya Pradesh. 330 women were selected by multistage random sampling. The aim was to study their maternal health status. The women were of lowest socio-economic status with an educational level of only 4.54%. It was seen that 73% women had three or more pregnancies. 22.42% of women had between three to four children and nearly 45% women reported having five or more children. However, nearly 34% women reported having abortions and 4.24% had still births. Nearly 35% women reported death of a child. Out of them, 60.86% women reported death of children below one year, while 39.13% reported the age of child which died was between one to five year and main causes of death were tetanus, diarrhoea and pneumonia. Majority of the deliveries (88.69%) were domiciliary and all of them were conducted by untrained dias, and in nearly 89% cases umbilical cord was cut by the arrow. Regarding tetanus toxoid immunisation, it was seen that only 45% were completely immunised. Thus, it may be stated that these tribal women have unsatisfactory maternal health and corrective measures for improvement of health status is warranted.

**OC.26 SCANNING ELECTRON MICROSCOPIC STUDIES ON THE STRUCTURE OF COMMON SALT FORTIFIED WITH NUTRIENTS.** *S Ranganathan and L Singotamu, National Institute of Nutrition, Hyderabad.*

Salt fortification with nutrients is an accepted approach to alleviate the population from the deficiency disorders of micronutrients. The efficacy of salt fortification to combat iodine deficiency disorders and iron deficiency anaemia has been well established in the population. Trouble-free technologies are now available to manufacture iodised salt (IS), iron fortified salt (IFS) and double fortified salt (DFS), which has both iodine and iron. The present day technologies are so good that it is extremely difficult to distinguish by visual means common salt (CS) from IS or IFS or DFS. All these fortified salts are identifiable by chemical methods. In view of the fact that Scanning Electron Microscopy (SEM) is a useful tool in food technology, attempts were made to use SEM to understand the ultrastructure of CS, IS, IFS, DFS and also the chemicals used as fortificants, such as potassium iodate ( $KIO_3$ ), ferrous sulphate ( $FeSO_4$ ) and sodium hexametaphosphate. A thin layer of samples were spread on SEM stub with double adhesive tape and then coated (300  $\text{\AA}$  thickness) with gold and palladium in sputter coating unit. Samples were scanned by Hitachi SEM at 10 KV operating voltage. Required pictures were taken at appropriate magnifications. The results showed that the individual ultrastructures of CS,  $KIO_3$ ,  $FeSO_4$  and sodium hexametaphosphate were different. Noticeable changes were observed at ultrastructural level of fortified salts and common salt. Further studies in this regard are planned.

**OC.27 CORRELATION BETWEEN BLOOD PRESSURE LEVELS AND SPECIFIC RISK FACTORS IN ADULTS.** *Lakshmi Janakamma K and D Peramma. Department of Home Science, SV University, Tirupati.*

High blood pressure is a global problem. It emerged as a major public health problem even in the developing countries like India. Due to the diversified socio, cultural and dietary practices existing in India, the epidemiological

findings on blood pressure levels are not applicable to draw a composite picture of the whole country. Hence the need was felt for more regional community based studies for both prevention and treatment of blood pressure. Therefore, the present study was proposed to measure the blood pressure levels of 433 adult male and female volunteers of Tirupati (A.P.). The correlation between systolic and diastolic blood pressure and specific non nutritional risk factors was studied. The data reveals that among the male (n=211) and female (n=222) subjects, 61.1 and 74.8% are with the normal blood pressure level whereas 30.3 and 21.6% and 8.5 and 3.6% are the first identified mild hypertensives and hypertensives respectively. Known hypertensives were excluded from the study. Significant differences were noticed in the mean systolic blood pressure levels among male and of female subjects, with less than 40 years and more than 40 years of age. However, the differences in diastolic blood pressure were not significant statistically. A positive correlation (significant at 5% level) was noticed between both systolic and diastolic blood pressure and age, BMI and family history of blood pressure. Stepwise multiple regression analysis revealed that 10.09% and 11.39% of variance in systolic and diastolic blood pressure respectively was due to the risk factors, age, BMI and family history of blood pressure.

**OC.28 FOOD PREFERENCES OF SLUM CHILDREN.** *Meena Phadnis* and *Smita Verma*. Government MLB Girls College, Bhopal, Madhya Pradesh.

This study was undertaken in a slum area of Bhopal, which comes under the scheme "Samekit Bal Vikas Pariyojana", Ban Ganga, Bhopal. The sample was selected from Anganwadi Kendra, Roshanpura No.687, Ward No.27. The study was done in three phases. Firstly, a baseline survey was done to find out existing dietary pattern of children, secondly some nutritious recipes based on locally available foods were prepared and standardised. During the last phase, these recipes were fed to various groups of children, i.e., weaning, preschool and school going children. After feeding these preparations to children, they were interviewed for knowing the acceptability of these recipes. For weaning groups, mother of the child was interviewed. The result of the study show that 50% of children had shown no particular choice for a particular food. Though the standardised nutritious recipes were well-accepted by most of the children, sweet preparations were liked by 70% preschoolers, while 65% school going children liked the salty recipes. It may be concluded that these children of low income group lacked variety of food in their diets and this may be a reason for the disinterest in the choice of food. Thus, it is concluded that variety of foods in the diets of children can develop their interest in foods and popularisation of low-cost nutritious recipes based on local foods and such foods by simple methods can be done through different child feeding programmes, thus educating the family by the channel 'From child to parent education'. Nutrition education to mothers can play a major role in the process.

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